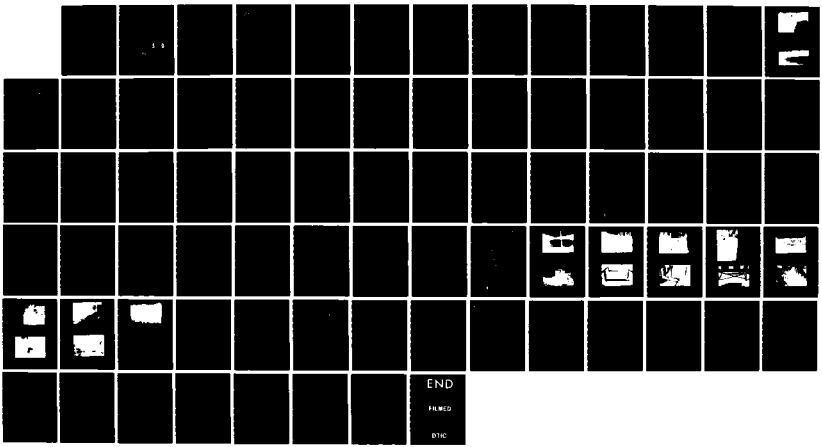
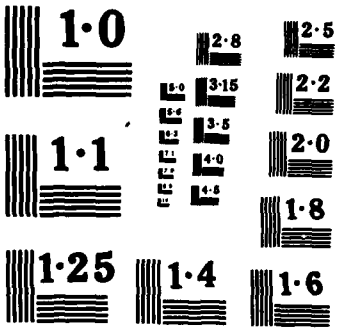
AD-A154 489 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS FOUNDRY POND DAM MA 0..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV FEB 80 1/1

UNCLASSIFIED F/G 13/13 NL




1·0
2·8
2·5
3·15
2·2
3·5
1·1
4·0
2·0
4·5
1·8
1·25
1·4
1·6

JONES RIVER BASIN
KINGSTON, MASSACHUSETTS

FOUNDRY POND DAM
MA 00394

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

FEBRUARY 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 00394	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Foundary Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE February 1980 13. NUMBER OF PAGES 59
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Jones River Basin
Kingston, Massachusetts
Smelt Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Foundry Pond Dam is an earth embankment about 210 ft. long with a maximum height of about 15 ft. and an irregular crest which has a minimum width of about 18 ft. The dam is considered small in size woth a hazard potential of high. The dam appeared to be in fair condition. There are deficiencies which the owner shoud engage in a professional engineer to check out.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF
NEDED

MAY 23 1980

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Foundry Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Cobb and Drew Company, Kingston, Massachusetts 02364.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

FOUNDRY POND DAM

MA 00394

JONES RIVER BASIN

KINGSTON, MASSACHUSETTS

PHASE I INSPECTION REPORT

NATIONAL DAM INPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.	MA 00394
Name of Dam:	Foundry Pond Dam
Town:	Kingston
County & State:	Plymouth County, Massachusetts
Stream:	Smelt Brook
Date of Inspection:	October 24, 1979

BRIEF ASSESSMENT

Foundry Pond Dam is an earth embankment approximately 210 feet long with a maximum height of about 15 feet and an irregular crest which has a minimum width of about 18 feet. The upstream slope of the embankment is about 1H:IV and is provided with minimal protection. A factory building (part of a downstream mill complex) abuts the embankment along the crest of the dam to form the downstream face of the dam. The spillway system located near the right abutment, consists of a 6-foot wide concrete weir and chute system which outlets into a channel located beneath the Cobb and Drew Company factory buildings. The structure was originally built about 1848 to provide water power, but is currently used for industrial purposes and as a reserve for fire protection in the Town of Kingston.

Foundry Pond has a contributing drainage area of 2.2 square miles and a maximum storage capacity of approximately 64 acre-feet. Therefore, Foundry Pond Dam is classified in the "Small" size category. Due to the location of the downstream mill complex, excessive property damage and the loss of several lives could be expected if a failure of the dam were to occur during the operating hours of the mill. At least six homes located approximately 550 feet downstream of the dam would also be subjected to damage in the event of an embankment failure. Therefore, Foundry Pond Dam is classified in the "High" hazard potential category. The recommended test flood range for a "Small" size, "High" hazard structure is from one-half of the Probable Maximum Flood (PMF) to the full PMF. The selected test flood for this project is the full PMF.

The test flood peak inflow to Foundry Pond was computed as 2,395 cfs. The routed test flood outflow of 2,390 cfs overtops the embankment by 2.3 feet. The spillway is capable of discharging 172 cfs prior to overtopping of the embankment, which is about 7 percent of the routed test flood outflow.

On the date of the inspection, Foundry Pond Dam appeared to be in fair condition. However, the upstream face of the embankment is fairly steep, is inadequately protected against erosion, and is overgrown with brush and trees.

Within one year after receipt of this Phase I inspection report, a qualified registered professional engineer, experienced in the design and construction of dams, should be retained by the Owner to: (1) perform a detailed hydrologic and hydraulic study to assess the need for increasing the project discharge capacity; (2) investigate the seismic stability of the dam; (3) design a low level outlet for emergency drawdown of the reservoir; and (4) direct the removal of the trees and brush growing on the upstream face and the crest of the embankment.

In addition, the Owner should implement the following operational and maintenance procedures: (1) provide erosion protection for the upstream face of the embankment; (2) repair the timber support for the flashboards at the entrance to the spillway system; (3) repair the cracked and spalled concrete in the spillway system; (4) fill, grade, and reseed all depressions and other surface irregularities on the crest of the dam; (5) develop and implement an ongoing operation and maintenance program; (6) institute a program of annual periodic technical inspection; (7) develop a formal surveillance and flood warning plan, including round-the-clock monitoring during heavy precipitation.

O'BRIEN & GERE ENGINEERS, INC.

John J. Williams

Date 24 MARCH 1980

John J. Williams, P.E.
Vice ~~President~~
New York Registration No. 050794

STATE OF NEW YORK
JOHN J. WILLIAMS
No. 050794
LICENSED PROFESSIONAL ENGINEER

This Phase I Inspection Report on Foundry Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of theses guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

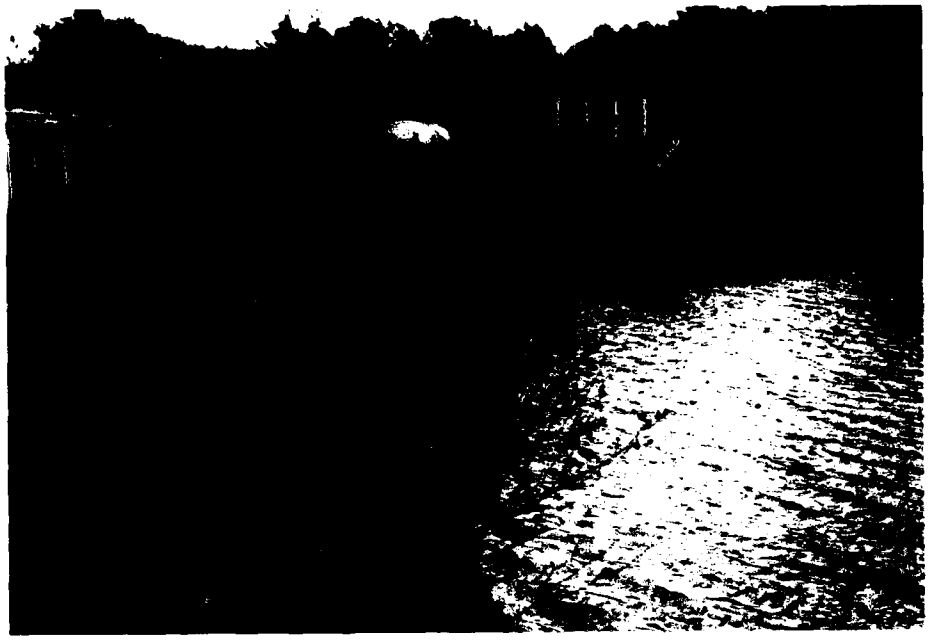
The Phase I Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

TABLE OF CONTENTS (Con't)

TABLE OF CONTENTS (Con't)

APPENDICES



UPSTREAM OVERVIEW OF THE FOUNDRY POND DAM FROM THE LEFT ABUTMENT SHOWING INDUSTRIAL FACILITIES IN THE IMMEDIATE BACKGROUND. (10/24/79)

UPSTREAM FACE OF THE FOUNDRY POND DAM LOOKING TOWARDS THE RIGHT ABUTMENT SHOWING VEGETATION AND A UTILITY POLE ON THE DAM AND INDUSTRIAL FACILITIES IN THE BACKGROUND. (10/24/79)

SECTION 7

ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Visual inspection of Foundry Pond Dam on October 24, 1979 revealed several conditions which could contribute to deterioration of the dam. These conditions include:

1. Lack of riprap or other means of erosion protection on the upstream face of the embankment.

2. Brush and trees growing along the upstream face and crest of the embankment.

3. Surface erosion across the dam crest, presumably caused by runoff from the factory building roof.

4. Cracks, surface wear and spalling of the spillway system concrete.

The condition of the wall at the downstream face of the embankment appears to be good. The wall is straight and appears to be free of defects which could indicate structural problems.

b. Adequacy of Information. The information provided by DEQE and the Owner (combined with the visual inspection) is considered adequate to make a Phase I evaluation.

c. Urgency. The recommendations and remedial measures described in this Section should be implemented within one year from the date of receipt of this report.

7.2 Recommendations

It is recommended that a qualified registered professional engineer, experienced in the design and construction of dams, be retained by the Owner to: (1) perform a detailed hydrologic and hydraulic study to assess the need for increasing the project discharge capacity; (2) investigate the seismic stability of the dam utilizing conventional equivalent static load methods; (3) design a low level outlet for emergency drawdown of the reservoir; and (4) direct the removal of the trees and brush growing on the upstream face and crest of the embankment. Any voids remaining in the embankment should be backfilled with suitable, thoroughly compacted material.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

At the time of the inspection, no signs of structural instability were observed. The upstream face of the dam is partially overgrown with brush and trees, thus restricting visual inspection. Surface erosion, which is in evidence on the crest and the upstream embankment face, presumably is caused by discharge from the roof drains of the factory building.

The spillway appears to be in fair structural condition. Cracks, spalling and surface wear along the inside surfaces of the concrete training walls were the observed deficiencies in the concrete which could eventually affect the structural integrity of the spillway system.

The wall forming the downstream face of the dam appears to be straight and shows no signs of cracking, displacement or seepage. However, the condition must be regarded with some degree of caution because it appears that the wall has recently been repointed and, consequently defects may have been obscured.

6.2 Design and Construction Data

According to the Owner, the dam was constructed about the same time the mill complex was built in 1848. No design or construction data are known to exist.

6.3 Post Construction Changes

The only known major construction modification was the construction of the concrete spillway. No data for the construction of the spillway is available.

6.4 Seismic Stability

Foundry Pond Dam is located in Seismic Zone 3 on the "Seismic Zone Map of Contiguous States". Therefore, according to the Recommended Guidelines for Phase I Safety Inspection of Dams, a seismic stability analysis should be performed as recommended in Section 7.

5.5 Dam Failure Analysis

Routing the breach flood to the primary damage center, the mill complex, was not considered necessary since any failure of the embankment would probably cause immediate destruction of property and loss of life at this location.

A failure of the embankment was simulated by the HEC-1-DB computer program assuming an 84-foot wide and 14-foot deep breach with vertical side slopes, developing within 1 hour. The failure is assumed to occur with the reservoir surface at the top of dam elevation. The resulting outflow was routed to the secondary damage center located approximately 550 feet downstream of the dam. The assumed channel cross-section at this location is shown on page D-3. The increase in stream depth at this point was computed to be 6.3 feet, or 3.8 feet above the channel banks with a maximum discharge of 1,194 cfs. The 6 homes in this area would probably be subjected to minor flooding by this depth of water, but it is extremely unlikely that any lives would be lost since the depth of water in the homes closest to the stream would be less than one foot.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Foundry Pond Dam has a watershed about 2.0 miles long and 1.1 miles wide. The 2.2 square mile drainage area lies almost entirely within the Town of Kingston and is heavily forested with several low-lying marshy areas. The topography ranges from Elev. 310 to Elev. 22.5 at normal pool surface. Smelt Brook approaches the pond from the southwest. Smelt Pond which covers an estimated 30 acres is the only appreciable impoundment upstream of Foundry Pond. There is only token development in the drainage area, except for approximately 100 buildings between Route 3 and the dam and several seasonal homes in the headwaters around Smelt Pond.

5.2 Design Data

Neither hydraulic nor hydrologic design data are available for Foundry Pond Dam.

5.3 Experience Data

According to the Owner, there are no records of pond surface elevations or overtoppings of the dam.

5.4 Test Flood Analysis

The recommended test flood range for a "Small" size, "High" hazard dam is from one-half of the Probable Maximum Flood (PMF) to the full PMF. Based on the extreme hazard to the mill complex due to its location, the selected test flood for this structure is the full PMF.

Hydrologic and hydraulic calculations were performed with the assistance of the HEC-1-DB computer program. The flood hydrographs were constructed from the Snyder unit hydrographs using Snyder coefficients, which reflects the rather flat terrain of the watershed, an initial infiltration of zero and a constant loss rate of 0.05 inches per hour. The Hop Brook Adjustment Factor was used to reduce the Probable Maximum Precipitation based on the drainage area. Stage vs. Discharge and Stage vs. Storage relationships were developed for Foundry Pond Dam. These relationships were utilized by the program to route the test flood through the dam. The reservoir water surface was assumed to be at the spillway crest elevation at the beginning of the storm event.

The peak inflow and outflow rates for the test flood at Foundry Pond Dam were calculated as 2,395 cfs and 2,390 cfs, respectively. The peak outflow corresponds to a reservoir stage of 6.8 feet above the spillway crest, or 2.3 feet above the top of dam elevation. The spillway capacity prior to overtopping of the dam was calculated to be 172 cfs, which is about 7 percent of the routed test flood outflow.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. According to Mr. Roy McLean, President of the Cobb and Drew Company, no routine operational procedures are in effect at this site. The only operation performed is the occasional insertion or removal of flashboards to regulate the pond level.

b. Description of Any Warning System in Effect. According to the Owner, there is no formal warning system in effect.

4.2 Maintenance Procedures

a. General. According to the Owner, other than occasional removal of debris at the spillway inlet, no maintenance tasks are performed on a routine basis.

b. Operating Facilities. According to Mr. McLean, the only operating facility for this structure is the flashboards which are replaced when needed.

4.3 Evaluation

The current maintenance program has not provided for proper maintenance of the upstream embankment face and crest of the dam. It does appear, however, that recent rehabilitation of the downstream wall has helped to restore its integrity.

c. Appurtenant Structures. The spillway system is the only outlet from Foundry Pond. The upstream portion of the spillway consists of a concrete 6-foot wide channel with 6.5 to 7-foot high training walls extending downstream for a distance of approximately 40 feet. At the inlet to the spillway system, there are flashboard slots which, at the time of inspection, were supporting flashboards to a height of approximately 2.75 feet above the invert of the channel. The timber support for the flashboards in the center of the inlet to the spillway system is in very poor condition and must be replaced (Refer to page C-1, Appendix C.). Approximately 16.5 feet downstream, a concrete weir is located 3 feet above the channel invert. This corresponds to an elevation approximately 6 inches lower than the upstream flashboard elevation at the time of the inspection due to the slope of the channel. Slots have also been provided above the concrete weir for insertion of flashboards.

The concrete in the spillway system appears to be in generally fair condition. Several cracks, surface wear and areas of surface spalling were observed and should be repaired.

Immediately downstream of this spillway section there is a concrete channel reach on a slope of approximately 1H:1V. This portion of the spillway conveys flow to another rectangular-shaped concrete channel which carries the flow under the mill complex. A profile of the service spillway has been included as page B-3 of Appendix B.

As Mr. Ray McLean stated, there is no low level outlet which could be used to drawdown the impoundment in case of an emergency.

d. Reservoir Area. The terrain along the perimeter of the pond is well vegetated and appears to be stable and free of appreciable erosion. The slope of the terrain around the pond varies from 2 percent to 25 percent.

e. Downstream Channel. The spillway system conveys discharge to the Cobb and Drew mill complex. Discharge flows through an underground conduit approximately 5.5 feet wide by 2.5 feet high under the mill complex and parking lot. The conduit outlets into a natural stream channel about 300 feet downstream of the pond. The channel is approximately 5.5 feet wide and is overgrown with brush and small trees on its banks. Photos 10 through 12 included in Appendix C illustrate the downstream channel conditions.

3.2 Evaluation

The dam appears to be in fair condition. The absence of riprap on the upstream face of the embankment and the presence of trees and brush on the crest and upstream face are conditions which should be corrected. A low level outlet should be provided for emergency drawdown of the reservoir. The timber support for the flashboards in the center of the inlet to the spillway system must be replaced. The depressions and other surface irregularities on the crest of the dam must be filled graded and reseeded. The cracks, surface wear and areas of surface spalling observed in the spillway system concrete must be repaired. Several photos are included in Appendix C to illustrate these conditions.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. Foundry Pond Dam was inspected on October 24, 1979. At the time of inspection, the water surface was approximately one inch above spillway crest elevation and about 4.5 feet below the top of the dam. Underwater areas were not inspected.

Observations and comments made during the field inspection appear on a checklist included as Appendix A of this report.

b. Dam. The dam appears to be in fair condition. The following features were observed:

1. The upstream face of the embankment is on a slope of approximately 1H:IV and, for the most part, the intermittent riprap does not provide adequate protection against erosion. Several small trees and bushes are growing on the upstream face of the embankment, thus restricting visual inspection. Stumps of two trees were also observed near the left abutment.

2. The crest of the dam is shaped irregularly with a maximum width of approximately 35 feet at the abutments and a minimum width of approximately 18 feet at the location of the abandoned mill race. Features present on the crest include:

a) Good grass cover.

b) Several depressions and other surface irregularities have been eroded across the crest, apparently as a result of discharge from the roof drains of the factory building.

c) A few trees, approximately 4 to 8 inches in diameter, are located on the crest.

d) One utility pole is located approximately 80 feet left of the abandoned mill race.

Several photos of the crest of the dam have been included in Appendix C.

3. Downstream support for the dam is provided by the masonry wall which also serves as the foundation wall for a portion of the mill complex.

The wall appears to be in good condition. On the date of the inspection, there were no signs of seepage,cracking, displacement, misalignment, or any other indication of structural deficiency.

SECTION 2

ENGINEERING DATA

2.1 Design

No design information with respect to the dam construction is available according to Mr. Roy McLean, President of the Cobb and Drew Company.

2.2 Construction

The dam appears to have been constructed at about the same time the Cobb and Drew Company buildings were constructed in 1848. Since that time, the only apparent modification was the construction of the concrete spillway (date unknown).

2.3 Operation

Operating procedures are limited to the installation and removal of flashboards for the purpose of increasing or decreasing storage capabilities, depending upon anticipated water needs or weather conditions.

2.4 Evaluation

a. Availability.

1. The inspection report included in Appendix B was obtained from the Massachusetts Department of Environmental Quality Engineering (DEQE), 100 Nashua Street, Room 532, Boston, Massachusetts, 02114.

2. A map of the Cobb and Drew mill complex, included as page B-1 of this report, was obtained from the Owner, Mr. Roy McLean.

b. Adequacy. Sufficient information was obtained during the field investigation, through conversations and material obtained from the Owner and from DEQE to conduct a Phase I dam evaluation.

c. Validity. The map included as page B-1 of Appendix B appears to be valid but does not include a great deal of detail. Pages B-2 and B-3 more clearly illustrate the spillway layout.

The State inspection report also appears to be accurate except that the indicated drainage area is 4 square miles versus the 2.2 square miles determined for this report.

i. Spillway.

1. Type	Sharp-crested
2. Length of Weir	6 feet
3. Crest Elevation	22.5
4. Gates	None
5. Upstream Channel	None
6. Downstream Channel	Stone lined channel which passes under the factory building.
7. General	Refer to pages B-2 and B-3 of Appendix B.

j. Regulating Outlets. None

c. Elevation. (NGVD)

1.	Streambed at Toe of Dam	12.0
2.	Bottom of Cutoff	Unknown
3.	Maximum Tailwater	20+
4.	Normal Pool	22.5
5.	Full Flood Control Pool	NA
6.	Spillway Crest (Ungated)	22.5
7.	Design Surcharge (Original Design)	Unknown
8.	Top of Dam	27.0
9.	Test Flood Design Surcharge	29.3

d. Reservoir Length. (Feet)

1.	Normal Pool	1,000
2.	Flood Control Pool	NA
3.	Spillway Crest Pool	1,400
4.	Top of Dam	1,600
5.	Test Flood Pool	1,700

e. Storage. (Acre-Feet)

1.	Normal Pool	21
2.	Flood Control Pool	NA
3.	Spillway Crest Pool	21
4.	Top of Dam	64
5.	Test Flood Pool	99

f. Reservoir Surface. (Acres)

1.	Normal Pool	6
2.	Flood Control Pool	NA
3.	Spillway Crest Pool	6
4.	Top of Dam	14
5.	Test Flood Pool	19

g. Dam.

1.	Type	Earth Embankment
2.	Length	210 feet
3.	Height	15 feet
4.	Top Width	18 Feet (minimum)
5.	Side Slopes	Upstream - 1H:IV Downstream - vertical wall of factory
6.	Zoning	Unknown
7.	Impervious Core	Unknown
8.	Cutoff	Unknown
9.	Grout Curtain	Unknown

h. Diversion and Regulating Tunnel. None

h. Design and Construction History. No information is available concerning the design and construction of Foundry Pond Dam. It is believed that the dam was constructed at the same time the Cobb and Drew Company buildings were constructed in 1848.

The installation of the concrete spillway appears to be the only construction work performed subsequent to the completion of the original construction. No information is available concerning when the concrete spillway was built.

i. Normal Operating Procedures. According to Mr. McLean, the only operating procedures are the occasional insertion or removal of flashboards to increase or decrease the storage capacity of the pond, depending upon water needs or anticipated weather conditions.

1.3 Pertinent Data

a. Drainage Area. The area draining to Foundry Pond encompasses 2.2 square miles to the southwest of the pond in the Town of Kingston. A small amount of development has taken place within the watershed, but the majority of the drainage area is heavily wooded. Smelt Pond, the only other appreciable body of water in the drainage area, is located about 1.5 miles upstream of Foundry Pond.

b. Discharge at Damsite. (Refer to discharge calculations included in Appendix D.)

1. Outlet Works. According to the Owner, no known outlets exist which could be used to draw down the impoundment.

2. Maximum Known Flood. According to the Owner, no flood data exists for this site.

3. Ungated Spillway Capacity at Top of Dam. The ungated spillway capacity at the top of the dam Elev. 27.0 is 172 cfs.

4. Ungated Spillway Capacity at Test Flood Elevation. At the test flood Elevation of 29.3, the spillway capacity is 319 cfs.

5. Gated Spillway Capacity at Normal Pool Elevation. Not Applicable.

6. Gated Spillway Capacity at Test Flood Elevation. Not Applicable.

7. Total Spillway Capacity at Test Flood Elevation. At the test flood Elevation of 29.3, the spillway capacity is 319 cfs.

8. Total Project Discharge at Top of Dam. The ungated spillway capacity at the top of the dam Elevation 27.0 is 172 cfs.

9. Total Project Discharge at Test Flood Elevation. At the test flood Elevation 29.3, the total project discharge is 2390 cfs.

1. The upstream face of the embankment has a slope of approximately 1H:IV with some small riprap stones, but for the most part it is unprotected and subject to erosion.

2. The crest of the dam is irregular with a minimum width of approximately 18 feet at the location of the abandoned millrace.

3. The downstream embankment face is vertical since the wall forming the foundation of the nearest mill building abuts the embankment at the crest of dam elevation.

The spillway system is located near the right abutment and consists of a 6-foot wide concrete channel. Water entering the channel flows over a set of flashboards. Approximately 16 feet downstream of the flashboards, the discharge flows over a concrete weir to an open channel which carries the discharge to the mill buildings. Discharge flows through an underground conduit about 5.5 feet wide by 2.5 feet high under the mill complex and parking lot.

An abandoned millrace is located 21 feet to the left of the spillway system inlet. It appears that the inlet to this millrace is completely blocked.

According to Mr. Roy McLean, President of the Cobb and Drew Company, there is no provision for draining the pond.

c. Size Classification. Foundry Pond Dam has a maximum embankment height of approximately 15 feet which places it in the "Small" size category for height because it is less than 40 feet high. It also falls into the "Small" size category for storage since its maximum storage capacity of 147 acre-feet is less than the 1,000 acre-foot upper limit for "Small" size structures. Therefore, Foundry Pond Dam is classified as "Small".

d. Hazard Classifications. The Cobb and Drew Company buildings abut the downstream edge of the crest of Foundry Pond Dam. The remainder of the industrial complex is located immediately downstream of the embankment. A failure of the dam would result in probable loss of life and excessive property damage if the failure occurred during factory operating hours. In addition, at least six homes located approximately 550 feet downstream of the embankment would be subjected to damage in the event of a dam failure. Therefore, Foundry Pond Dam is classified in the "High" hazard category.

e. Ownership. The dam is owned by Mr.R.McLean, President of the Cobb and Drew Company, 6 Prospect Street, Kingston, Massachusetts, 02364; Telephone 617-585-2587.

f. Operator. The dam is operated by maintenance personnel of the Cobb and Drew Company, 6 Prospect Street, Kingston, Massachusetts, 02364; Telephone 617-585-1587.

g. Purpose of Dam. Originally, the dam was constructed to provide water power for the factory. According to Mr. McLean, the water is currently being utilized for industrial purposes and as a reserve for fire protection in the Town of Kingston.

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
FOUNDRY POND DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. The National Dam Inspection Act (Public Law 92-367), passed by Congress on August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate the National Program for Inspection of Dams throughout the United States. Responsibility for supervising inspection of dams in the New England Region has been assigned to the New England Division of the Corps of Engineers. O'Brien & Gere Engineers, Inc. has been retained by the New England Division to inspect and report on selected non-federal dams in the Commonwealth of Massachusetts. Authorization and Notice to Proceed were issued to O'Brien & Gere by a letter dated November 6, 1979 and signed by Colonel William E. Hodgson, Jr. Contract No. DACW33-80-C-0014 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection. The purpose of performing technical inspection and evaluation of non-federal dams is to:

1. Identify conditions which threaten public safety and make the Owner aware of any deficiencies to permit the Owner to correct them in a timely manner.

2. Encourage and prepare the states to initiate effective dam safety programs for non-federal dams as soon as possible.

3. Update, verify, and complete the National Inventory of Dams.

1.2 Description of Project. (Information with regard to this dam was obtained from Mr. Roy McLean, President of the Cobb and Drew Company, and from the Massachusetts Department of Environmental Quality and Engineering (DEQE)).

a. Location. Foundry Pond Dam is located on Smelt Brook in the Town of Kingston, Massachusetts. Smelt Brook flows into the Jones River approximately 3,000 feet downstream of the dam. A portion of the USGS Quadrangle map entitled "Plymouth, Massachusetts" has been included as Figure 1 on page vi of this report to illustrate the location. USGS reference coordinates for this dam are N 41°59.1' and W 70°42.6'. The buildings of the mill complex, which represent the major damage center, are located immediately downstream of the dam.

b. Description of Dam and Appurtenances. Foundry Pond Dam is an earth embankment approximately 210 feet long with a maximum embankment height of 15 feet. The embankment has the following features:

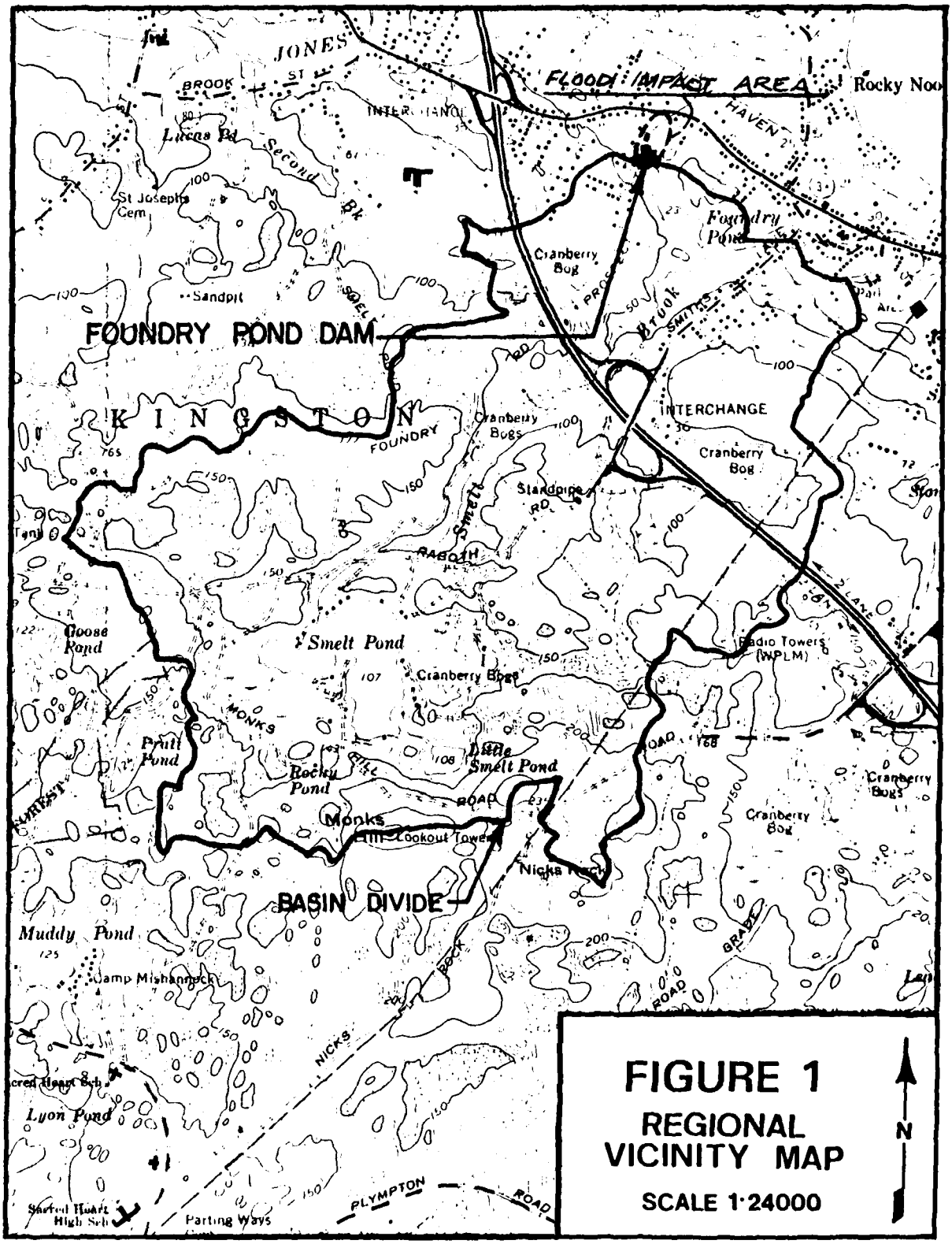


FIGURE 1
REGIONAL VICINITY MAP
SCALE 1:24000

7.3 Remedial Measures

a. Operation and Maintenance Procedures. The Owner should also implement the following operation and maintenance procedures:

1. Provide riprap or other means of erosion protection for the upstream face of the embankment.

2. Repair the timber support for the flashboards at the entrance to the spillway system.

3. Repair cracked and spalled concrete in the spillway system.

4. Fill, grade, and reseed all depressions and other surface irregularities on the crest of the dam to provide a uniform surface.

5. Route the drainage from the factory building roof away from the crest of the dam to help prevent surface erosion.

6. Develop and implement an ongoing operation and maintenance program to insure the future integrity of the dam.

7. Institute a program of annual periodic technical inspection.

8. Develop a formal surveillance and flood warning plan, including round-the-clock monitoring during heavy precipitation.

7.4 Alternatives

No valid alternatives to the recommendations described above are considered feasible for this site.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST

INSPECTION TEAM ORGANIZATION

Project: Foundry Pond Dam

National I.D. #: MA 00394

Location: Kingston, MA

Type of Dam: Earth Embankment

Inspection Date(s): October 24, 1979

Weather: Pty. Cloudy, Low 60's

Pool Elevation: 22.5± MSL

Inspection Team

Leonard Beck	O'Brien & Gere	Structures
Steven Snider	O'Brien & Gere	Foundations & Materials
Alan Hanscom	O'Brien & Gere	Structures
Rodney Georges	Bryant & Associates	Hydrology/Hydraulics

*Mr. John J. Williams, Vice-President, O'Brien & Gere has visited the site but not necessarily in conjunction with the inspection team.

Owner's Representative

Mr. Roy McLean; President of Cobb and Drew, Inc.; Kingston, Massachusetts

VISUAL INSPECTION CHECK LIST

Project: Foundry Pond Dam

National I.D. #: MA 00394

Date(s): October 24, 1979

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	27.0±
Current Pool Elevation	23.0±
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed
Pavement Condition	N/A
Movement or Settlement of Crest	None
Lateral Movement	None
Vertical Alignment	Appears to be fair
Horizontal Alignment	Appears to be fair
Condition at Abutment and at Concrete Structures	Good
Indications of Movements of Structural Items on Slopes	None Observed
Trespassing on Slopes	Negligible
Vegetation on Slopes	Grass, some brush, few trees
Sloughing or Erosion of Slopes or Abutments	Slight Erosion
Rock Slope Protection - Riprap Failures	No slope protection

VISUAL INSPECTION CHECK LIST

Project: Foundry Pond Dam

National I.D. #: MA 00394

Date(s): October 24, 1979

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT (Con't)	
Unusual Movement or Cracking at or near Toes	N/A
Unusual Embankment or Downstream Seepage	Slight Moisture on d/s retaining wall
Piping or Boils	None Observed
Foundation Drainage Features	Unknown
Toe Drains	None
Instrumentation System	N/A

VISUAL INSPECTION CHECK LIST

Project: Foundry Pond Dam

National I.D. #: MA 00394

Date(s): October 24, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Not Visible
b. Weir and Training Walls	
General Condition of Concrete	Fair
Rust or Staining	Slight
Spalling	Slight
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None Observed
Drain Holes	None Observed
c. Discharge Channel	
General Condition	Fair

VISUAL INSPECTION CHECK LIST

Project: Foundry Pond Dam

National I.D. #: MA 00394

Date(s): October 24, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS (Con't)	
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	D/S of Cobb & Drew
Floor of Channel	Natural Stream
Other Obstructions	Discharge culvert from Cobb & Drew to d/s Channel

VISUAL INSPECTION CHECK LIST

Project: Foundry Pond Dam

National I.D. #: MA 00394

Date(s): October 24, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	Fair
Rust or Staining on Concrete	Slight
Spalling	Moderate
Erosion or Cavitation	Potential for Erosion
Cracking	Observed in Box
Alignment of Monoliths	N/A
Alignment of Joints	Unknown
Numbering of Monoliths	N/A

APPENDIX B

ENGINEERING DATA

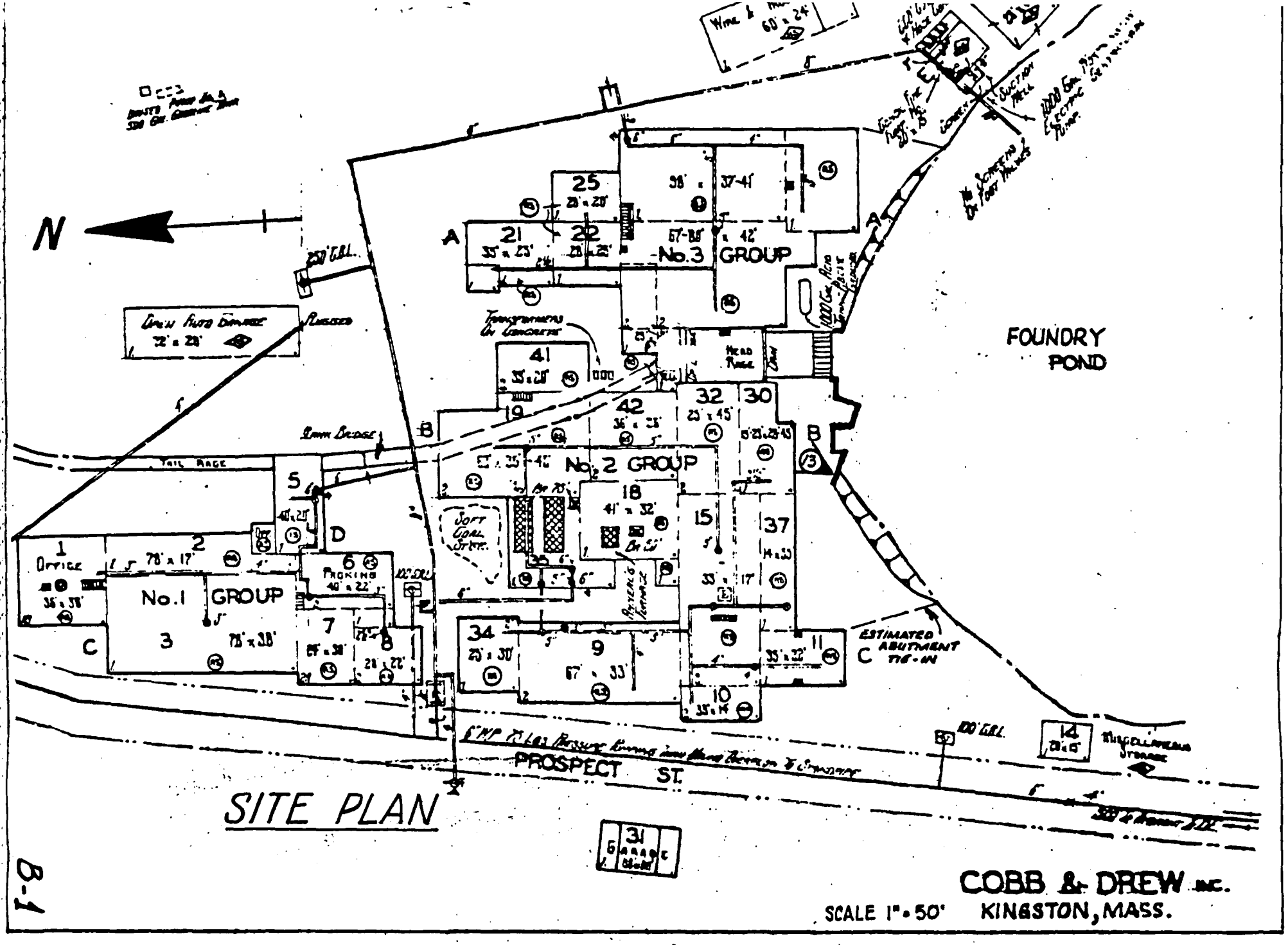
O'BRIEN & GERE ENGINEERS, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
FOUNDRY POND DAM				

APPENDIX B

ENGINEERING DATA

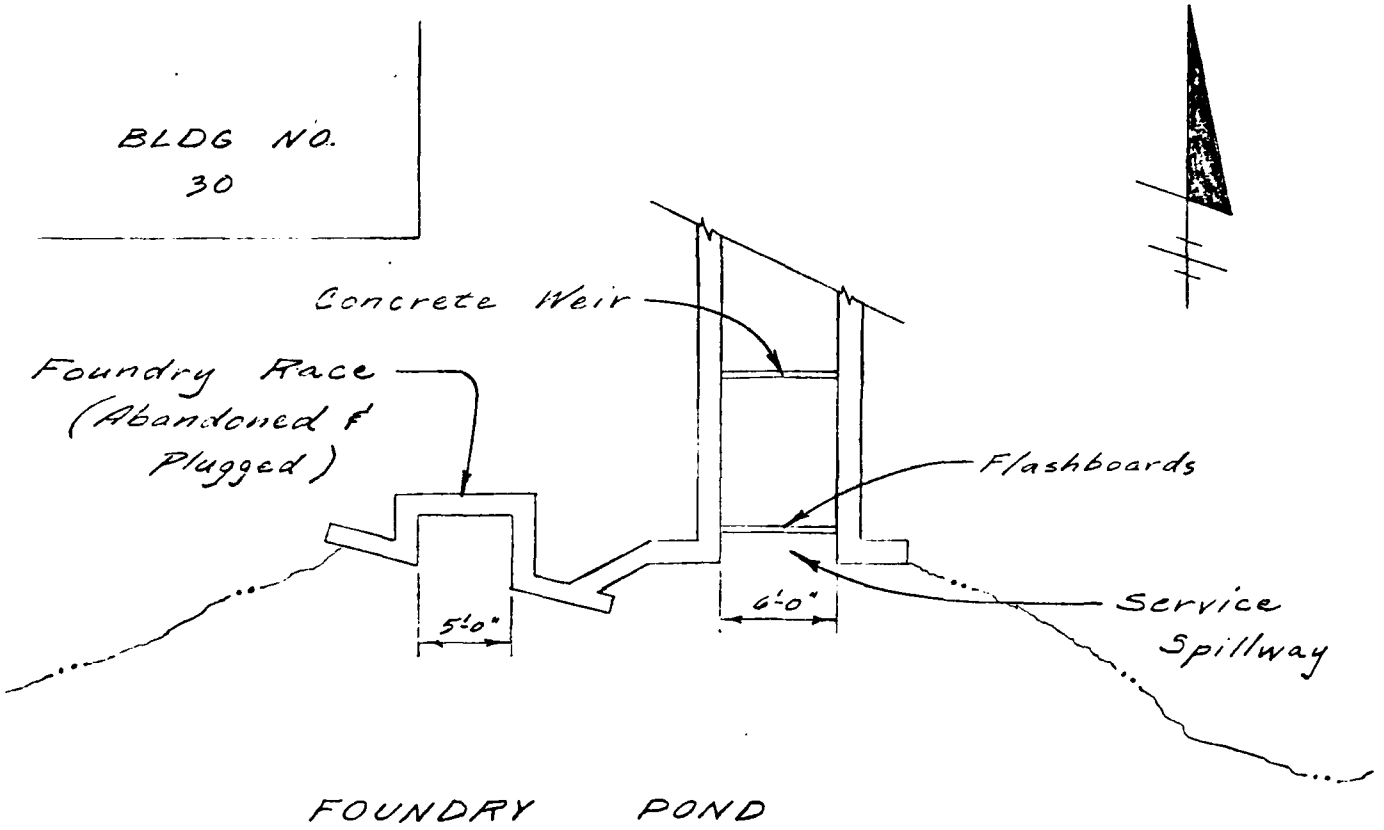
TABLE OF CONTENTS


N
FOUNDRY POND
No. 3 GROUP
No. 2 GROUP
No. 1 GROUP
OFFICE
PACKING
TAIL RACE
HEAD RACE
SOFT COAL STOR.
ESTIMATED ABUTMENT TIE-IN
PROSPECT ST.
SITE PLAN
COBB & DREW INC.
SCALE 1" = 50'
KINGSTON, MASS.

B-1

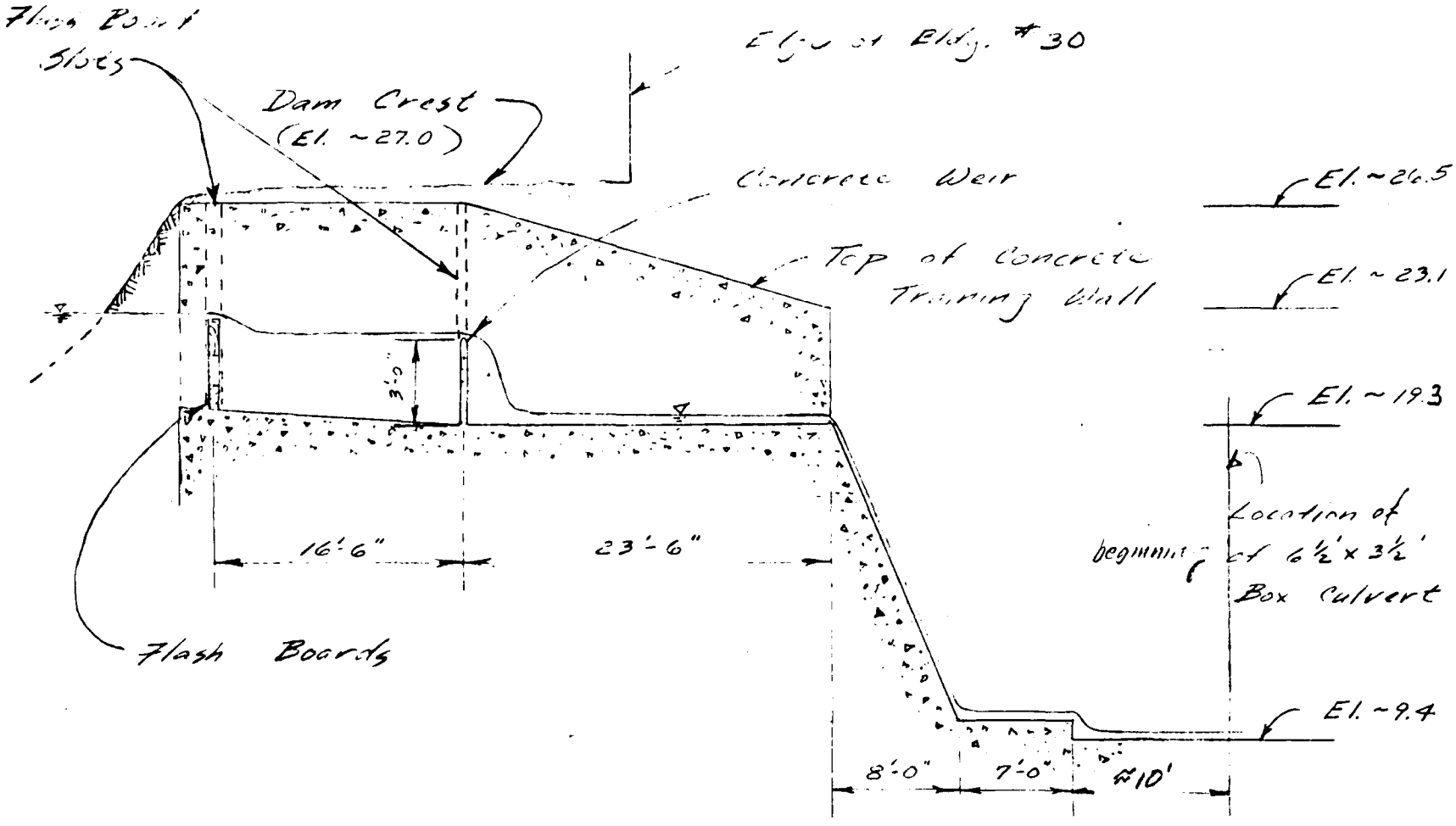
O'BRIEN & GERE ENGINEERS, INC.

SUBJECT	SHEET	BY	DATE	JOB NO



PLAN: SPILLWAY LAYOUT

Not To Scale



PROFILE : SERVICE SPILLWAY

Scale : Hor. 1" = 10'
Vert. 1" = 5'

Note :
All dimensions and elevations are based upon an assumed crest elevation of 27.0

B-3

O'BRIEN & GERE ENGINEERS, INC

SHEET | BY | DATE | JOB NO

Foundry Pond

April 30, 1974

Cobb and Drew Company
Prospect Street
Kingston, Massachusetts

RE: Inspection - Dam #7-12-145-4
Kingston
Foundry Pond Dam

Gentlemen:

On March 27, 1974, an engineer from the Massachusetts Department of Public Works inspected the above dam, owned by the Cobb and Drew Company.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970 (Dams-Safety Act).

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

1. The concrete flume has some cracks and is spalling. Corrective repairs are suggested.

2. Remove the growth of brush and trees from the embankment of the dam.

3. Some of the wooden supports for the flashboards are rotting and should be replaced.

4. Debris buildup in front of the principal spillway should be removed, if not already accomplished.

We call these conditions to your attention now, before they become serious and more expensive to correct.

Very truly yours,

F.C. Schwelm

FRED. C. SCHWELM, P.E.
Deputy Chief Engineer

LCH:jmp
cc: R. J. Kolleher
K. B. Harrison

B-4

9. COBB & DREW, INC. - OFFICE AND FACTORY IMMEDIATELY DOWNSTREAM OF THE DAM. (10/24/79)

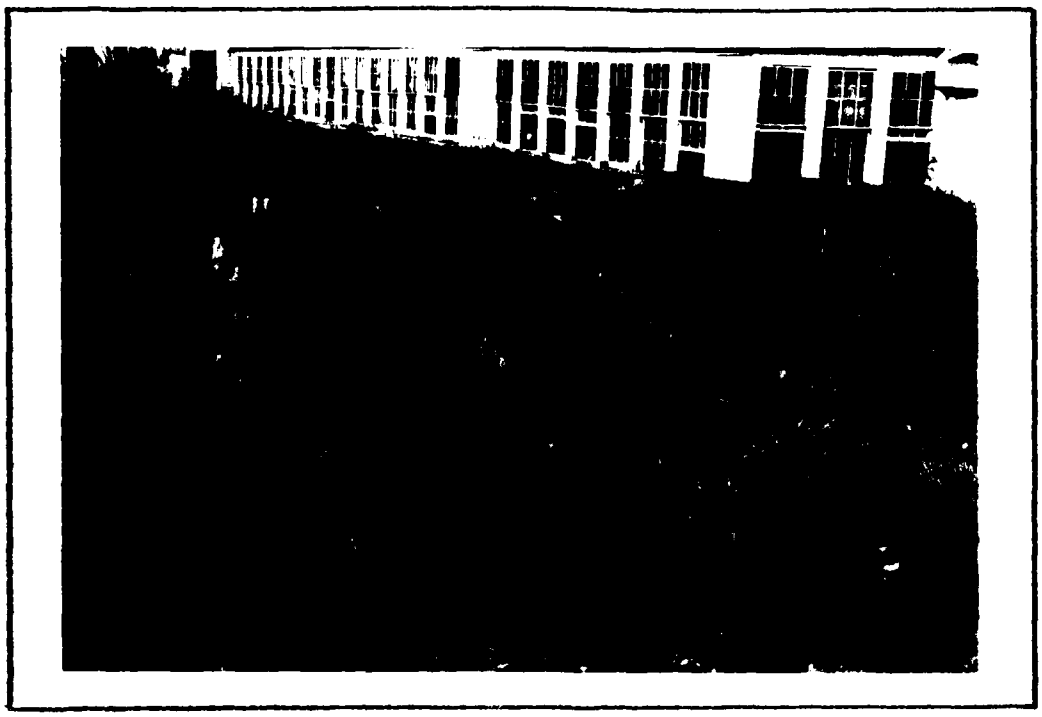
10. CULVERT OUTLET CARRYING SPILLWAY DISCHARGE FROM UNDER FACTORY BUILDINGS AND PARKING LOT. (10/24/79)

7. SPILLWAY DISCHARGE CHANNEL BETWEEN INDUSTRIAL BUILDINGS ABOUT 80 FEET DOWNSTREAM FROM THE SPILLWAY. (10/24/79)

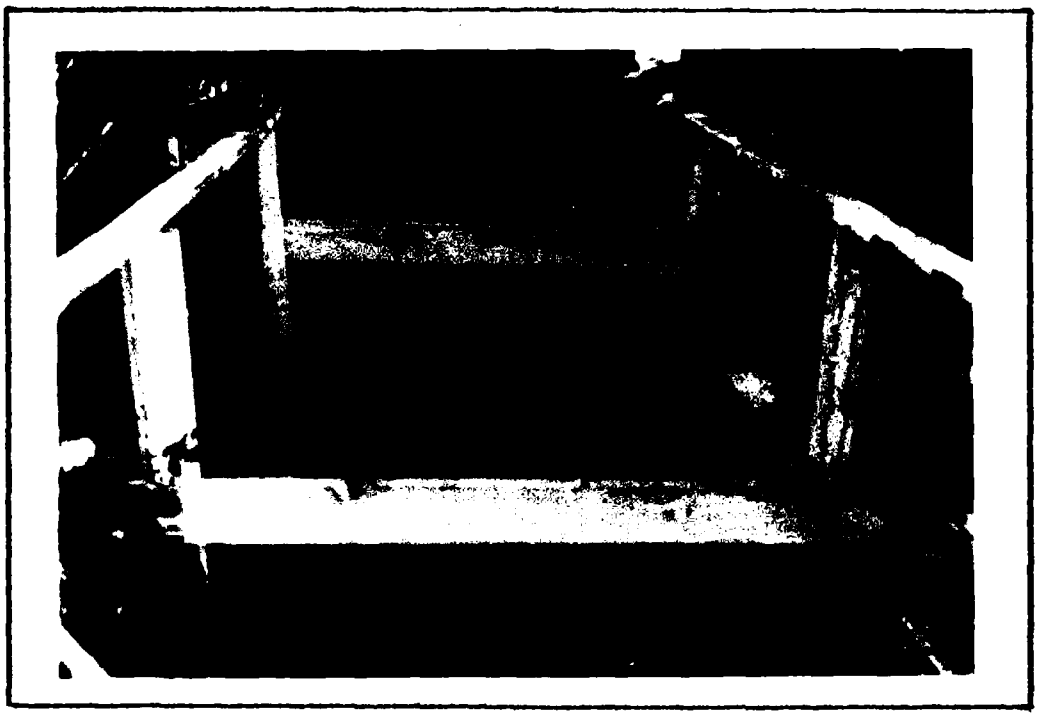
8. SPILLWAY DISCHARGE CHANNEL EMERGING FROM BENEATH INDUSTRIAL BUILDING ABOUT 170 FEET DOWNSTREAM FROM THE SPILLWAY. (10/24/79)

5. SPILLWAY SYSTEM LOOKING UPSTREAM FROM THE FOOTBRIDGE WITHIN THE INDUSTRIAL COMPLEX SHOWING STOP LOGS IN PLACE AND CONCRETE AND MASONRY TRAINING WALLS. (10/24/79)

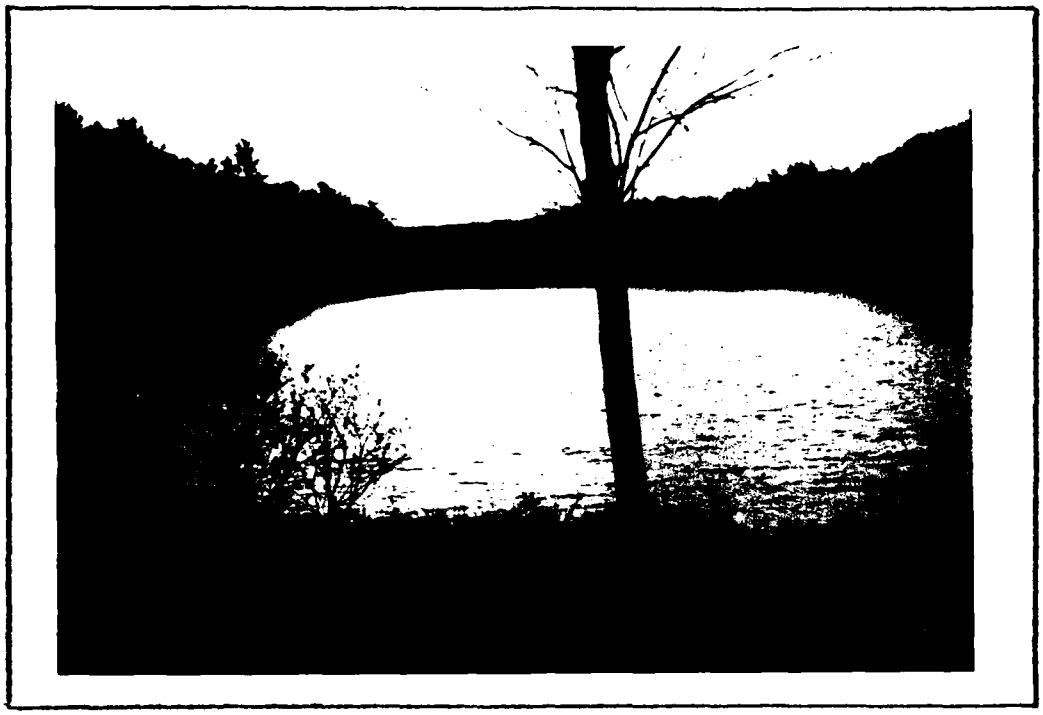
6. SPILLWAY SYSTEM LOOKING DOWNSTREAM AT THE FOOTBRIDGE WITHIN THE INDUSTRIAL COMPLEX. (10/24/79)



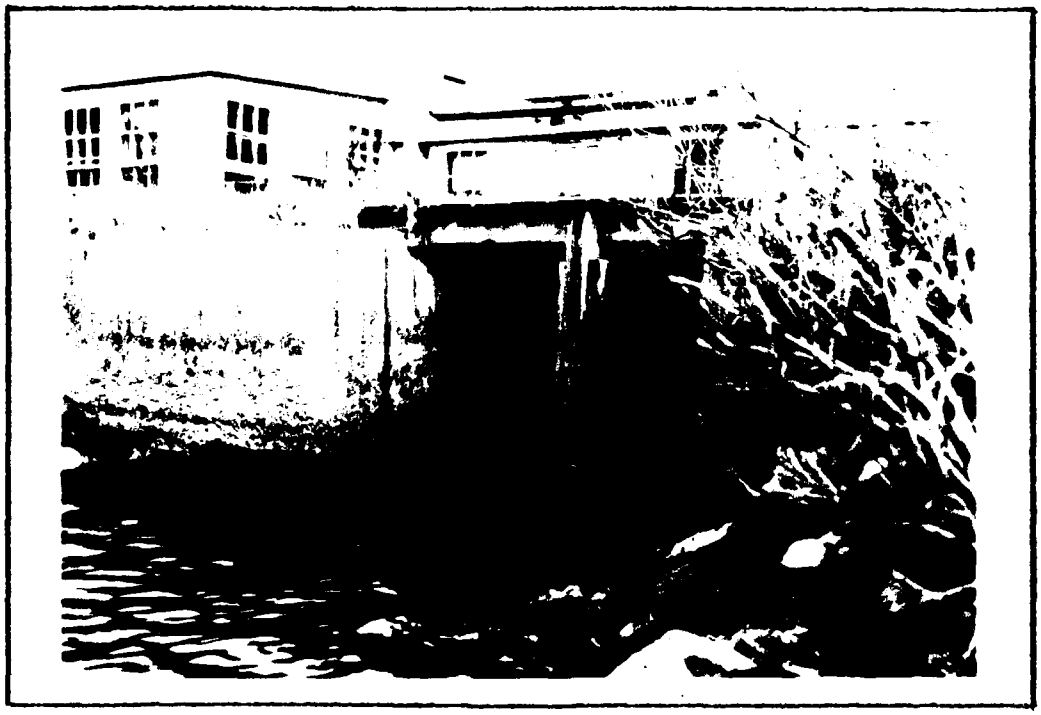
3. UPSTREAM END OF THE SPILLWAY SYSTEM. (10/24/79)



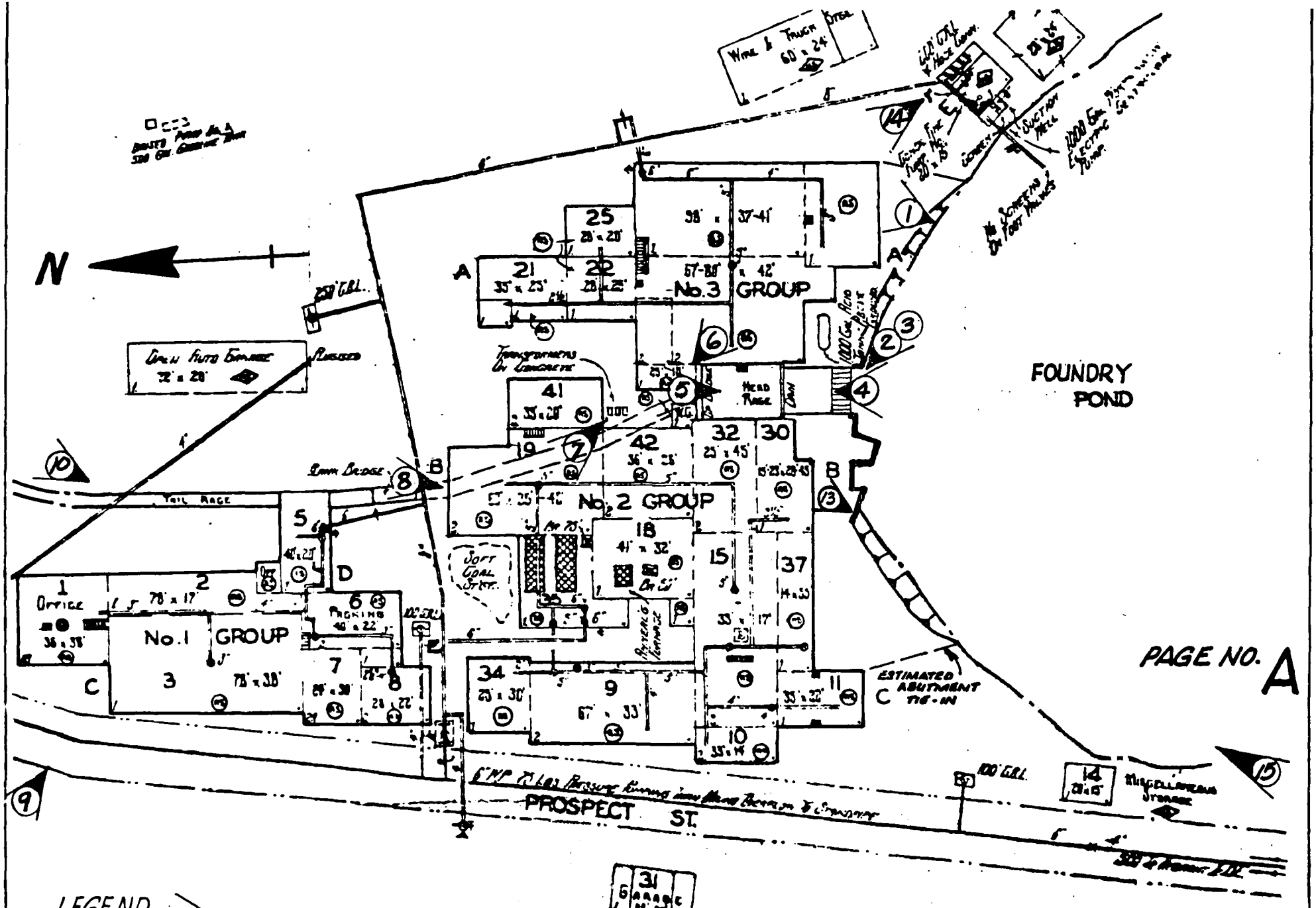
4. SPILLWAY SYSTEM LOOKING DOWNSTREAM AS VIEWED FROM THE FOOTBRIDGE NEAR THE SPILLWAY ENTRANCE. (10/24/79)



1. FOUNDRY POND AS VIEWED FROM THE RIGHT ABUTMENT OF THE DAM. (10/24/79)



2. UPSTREAM END OF THE SPILLWAY SYSTEM WITH THE INDUSTRIAL FACILITIES IN THE BACKGROUND. (10/24/79)



LEGEND

THE LOCATION AND DIRECTION IN WHICH EACH PHOTO WAS TAKEN AND THE NUMBER OF THE PHOTO

SCALE 1" = 50'

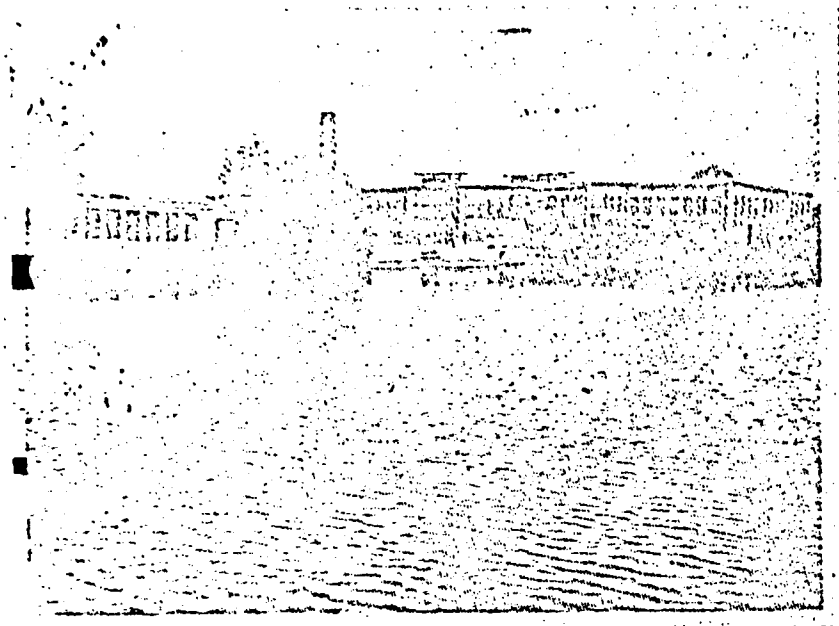
COBB & DREW INC.
KINGSTON, MASS.

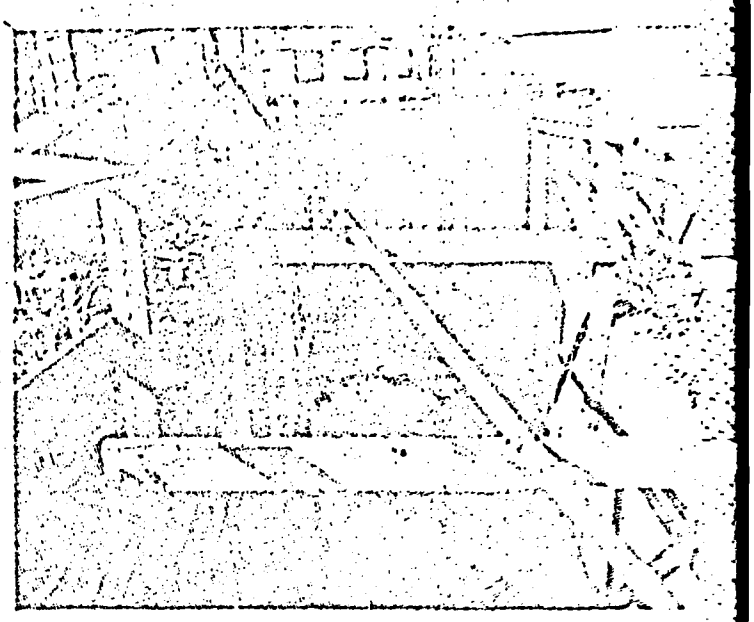
APPENDIX C

SELECTED PHOTOGRAPHS OF PROJECT

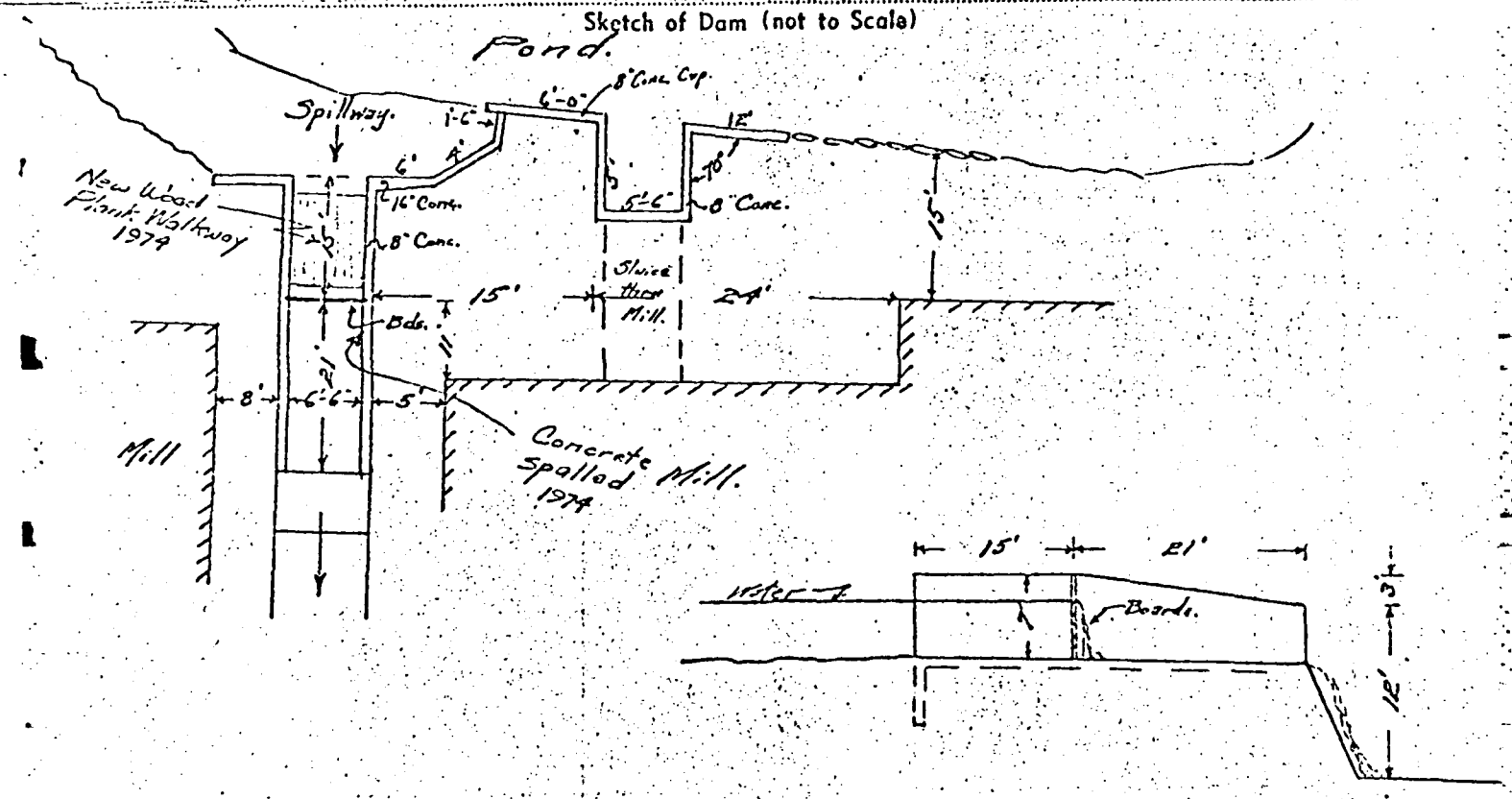
APPENDIX C

PHOTOGRAPHS





Sketch of Dam (not to Scale)



Dam # 7-12-145-4

DAM NO. 7-12-145-4

9.

A. Description of Present Land Usage Downstream of Dam:

30 % rural 70 % urban

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure ✓ yes _____ no

---

10.

Risk to Life and Property in Event of Complete Failure

No. of People 50 ±

No. of Homes 4

No. of Businesses 2

No. of Industries 0 Type _____

No. of Utilities 4 Type Gas, Water, Electd Tel.

Railroads 1 N.Y. N.H. & Hartford

Other Dams 0

Other Rte 3A

11.

Attach sketch of dam to this form showing section and plan on an 8½" x 11" sheet.

DESCRIPTION OF DAM

DISTRICT 7

Submitted by K. B. Harrison Dam No. 7-12-145-4

Date 4-15-74 ~~City~~/Town Kingston

Name of Dam Foundary Pond Dam.

1. Location: Topo Sheet No. 45 A

Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year Built Unknown Year/s of Subsequent Repairs 1974 New Plank Walkway

3. Purpose of Dam: Water Supply Some for mill Recreational

Irrigation Other Originally Power for Mill

4. Drainage Area: 4 Sq.Mi. Acres

5. Normal Ponding Area: Acres Ave.Depth

Impoundment: 11,000,000 Gals. Acre Ft.

6. No. and Type of Dwellings Located Adjacent to Pond or Reservoir

i.e. Summer Homes, etc. Cobb & Drew Mill Complex

7. Dimensions of Dam: Length 200'± Max. Height 15'±

Slopes: Upstream Face Varies 4'-6' wide

Downstream Face Flat to back of buildings

Width Across Top Varies - 15' minimum

8. Classification of Dam by Material:

Earth ✓ Conc. Masonry Stone Mason.

Timber Rockfill Other

Dam No. 7-12-145-4

12. Remarks & Recommendations: (Fully Explain)

Concrete flume & spillway has some cracks & some spalling, and although old, appears sound.
Three large trees on upstream face could be cut, also minor brush.
Some wooden supports for flashboards are rotting and should be replaced in the future.
Debris in front of principal spillway should be removed.

13. Overall Condition:

1. Safe ✓
2. Minor Repairs Needed ✓
3. Conditionally Safe - Major Repairs Needed
4. Unsafe
5. Reservoir Impoundment no Longer Exists (explain)

Recommend Removal from Inspection List

Dam No. 7-12-145-4

8. Downstream Face of Dam:
Condition: 1. Good ✓ 2. Minor Repairs ____
3. Major Repairs ____ 4. Urgent Repairs ____

Comments: Top of dyke flat to back of buildings

9. ~~Emergency~~ Spillway: Secondary - To Mill.

Condition: 1. Good ✓ 2. Minor Repairs ____
3. Major Repairs ____ 4. Urgent Repairs ____

Comments: Old Conc flume - no flashboards - no longer in use.

10. Water Level at Time of Inspection:

3.4 ft. above ____. below ✓. top of dam ____
principal spillway ✓. other ____.

11. Summary of Deficiencies Noted:

Growth (Trees & Brush) on Embankment Yes
Animal Burrows & Washouts No
Damage to Slopes or Top of Dam No
Cracked or Damaged Masonry Yes - some cracked & spalling downstream portion of spillway.
Evidence of Seepage No
Evidence of Piping No
Erosion No
Leaks No
Trash and/or Debris Impeding Flow Yes
Clogged or Blocked Spillway No
Other ____

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: ~~City~~/Town Kingston Dam No. 7-12-145-4

Name of Dam Foundary Pond Dam Inspected by: K. B. Harrison & G. Barnes

Date of Inspection 3-27-74

2. Owner/s: Per: Assessors ✓ Prev. Inspection _____

Reg. of Deeds _____ Pers. Contact _____

1. Cobb & Drew Co. Prospect St. Kingston, Mass.

Name	St.& No.	City/Town	State	Tel.No.

3. Caretaker: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name	St.& No.	City/Town	State	Tel.No.

4. No. of Pictures taken None

5. Degree of Hazard: (if dam should fail completely)*

1. Minor _____ 2. Moderate _____

3. Severe ✓ 4. Disastrous _____

*This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual ✓

Operative ✓ yes; _____ No

Comments: Conc Flume w/ flashboards.

7. Upstream Face of Dam: Condition:

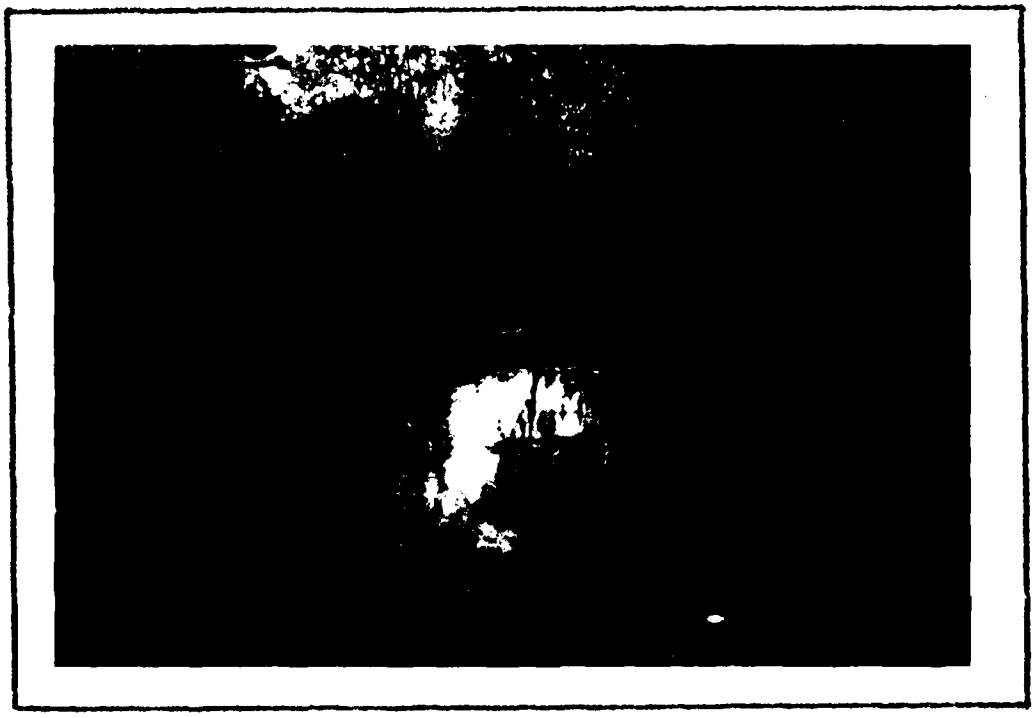
Conditions:

1. Good ✓ 2. Minor Repairs ✓

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: Three large trees should be cut. Minor small brush could be cut.

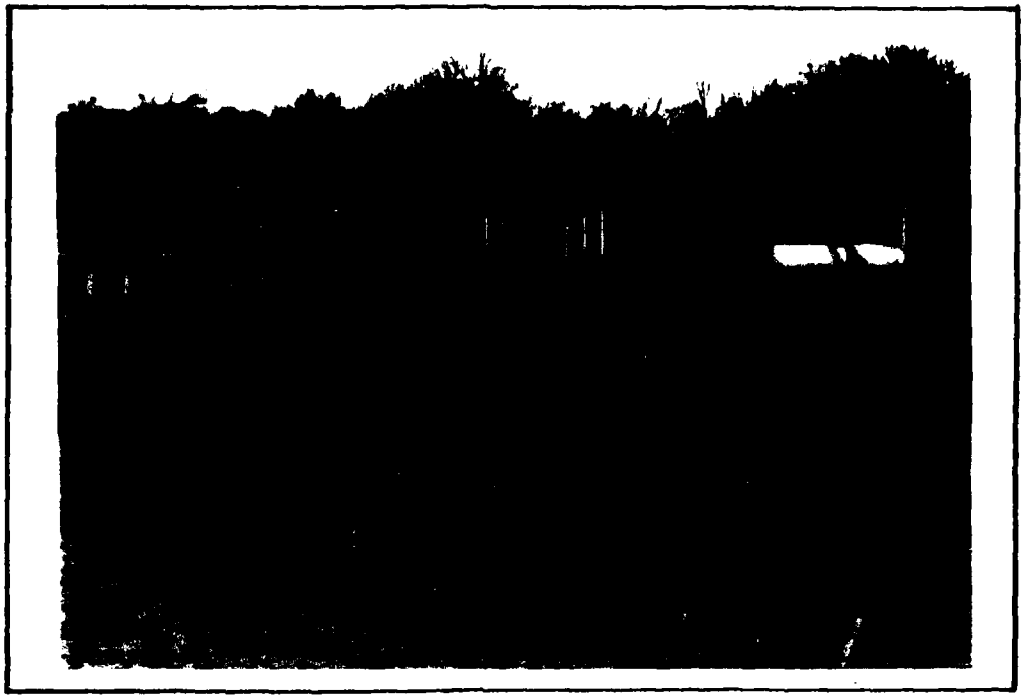
11. HIGHWAY CULVERT APPROXIMATELY 250 YARDS DOWNSTREAM OF THE DAM. (10/24/79)



12. OUTLET CHANNEL VIEWED FROM HIGHWAY CULVERT LOOKING DOWNSTREAM. (10/24/79)

13. UPSTREAM FACE OF THE DAM LEFT OF THE ABANDONED MILL RACE. (10/24/79)

14. POWER STATION ON THE RIGHT SIDE OF THE POND. (11/24/79)



15. OVERVIEW OF MILL COMPLEX SHOWING THE DAM, ABANDONED MILL RACE ENTRANCE AND THE ENTRANCE TO THE SPILLWAY SYSTEM. (10/24/79)

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

APPENDIX D

HYDROLOGIC & HYDRAULIC COMPUTATIONS

TABLE OF CONTENTS

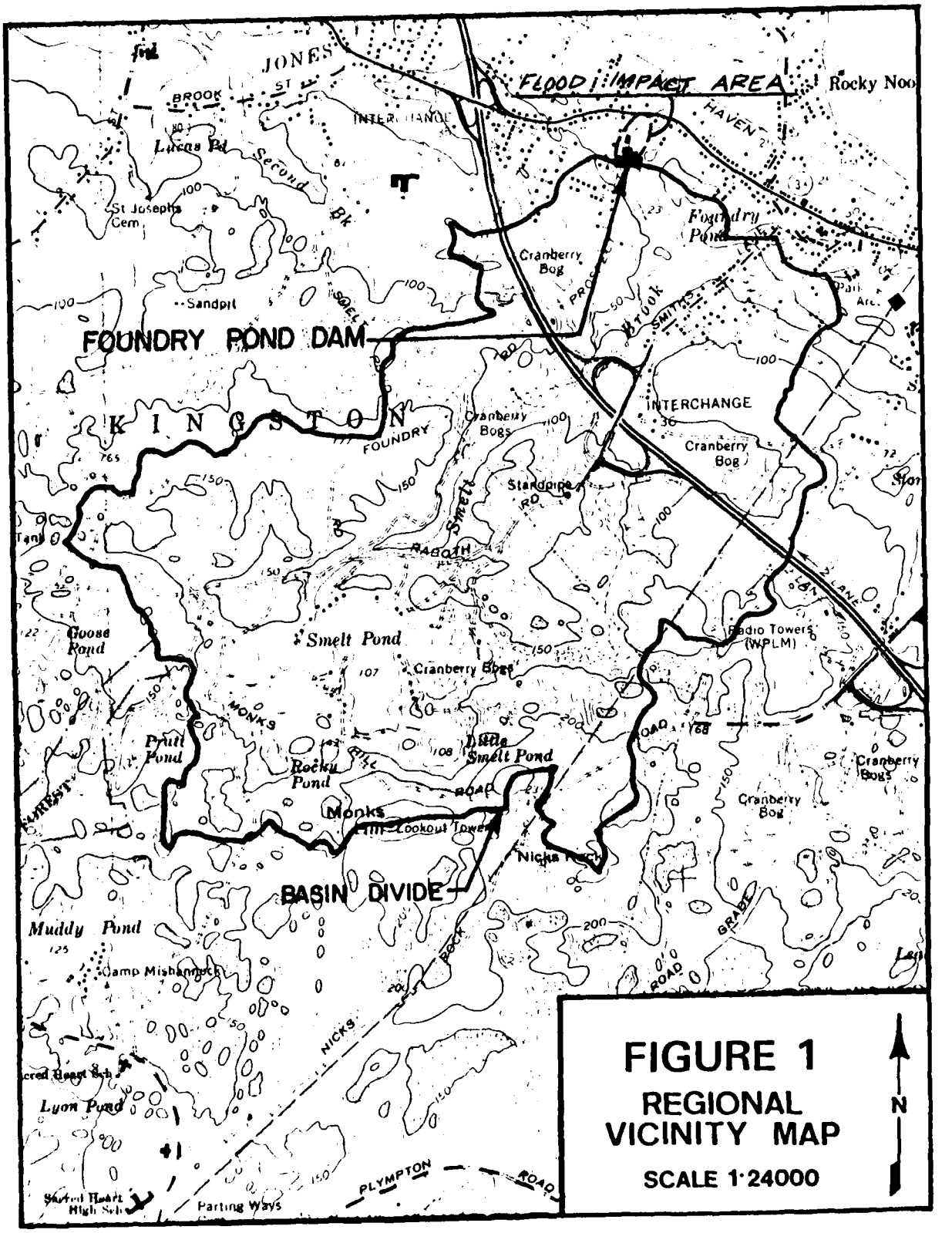


FIGURE 1

REGIONAL VICINITY MAP

SCALE 1:24000

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB FOUNDRY POND DAM
SHEET NO 0-2 OF
CALCULATED BY RG DATE
CHECKED BY RRB DATE
SCALE

FOUNDRY POND DAM - H & H

1/

DRAINAGE AREA = 2.2 sq. Mi

SNYDER HYDROGRAPH COEFFICIENTS

$C_t = 4.0$ $C_p = 0.5$

Tp COMPUTATIONS

$L = 2.39$ MILES $L_{ca} = 1.14$ MILES

$T_p = C_t \cdot (L \times L_{ca})^{.3}$

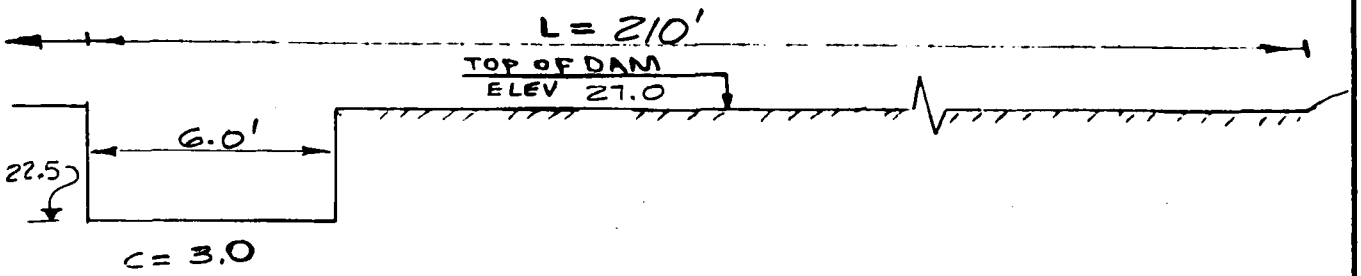
$T_p = 4 \times (2.39 \times 1.14)^{.3} \cong$ 5.40 Hours

PMP DATA

FROM HMS #33 THE 24 HOUR 200 SqMi INDEX RAINFALL IS 21.5

6hr. % OF INDEX FOR THIS BASIN = 111
12hr. % " " " " " = 124
24hr. % " " " " " = 133

DAM ELEVATION & LENGTH and SPILLWAY DIMENSIONS SKETCH



C = 2.8 TOP OF DAM

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB FOUNDRY POND DAM
SHEET NO D-3 OF
CALCULATED BY RG DATE
CHECKED BY RRB DATE
SCALE

FOUNDRY POND DAM H&H

STAGE DISCHARGE

H = 0 @ SPILLWAY CREST -- ELEVATION = 22.5 MSL

1) SPILLWAY : C = 3.0 L = 6' $Q_S = CLH^{1.5}$

2) TOP OF DAM : C = 2.8 L = 216' - 6' = 210' $Q_{TOP} = CL(H-4.5)^{1.5}$

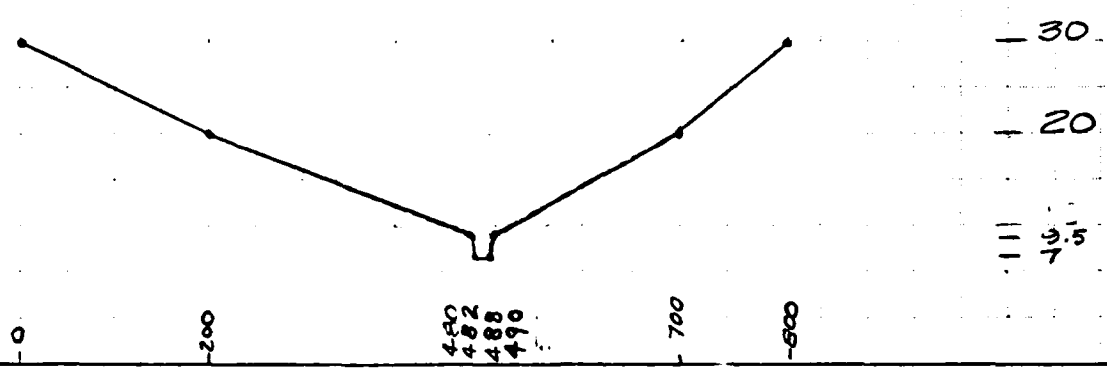
ELEVATION MSL	H Ft.	Q_S CFS	Q_{TOP} CFS	ΣQ CFS
22.5	0	0	0	0
24.5	2	51	0	51
26.5	4	144	0	144
27.0	4.5	172	0	172
29.0	6.5	298	1,663	1,961
31.0	8.5	446	4,704	5,150
33.0	10.5	612	8,642	9,254

STAGE STORAGE

	ELEV. (MSL)	AREA (AC.)	STORAGE (AC.-FT.)
	12	0	0
NORMAL POOL	22.5	6	21
	30	20	113

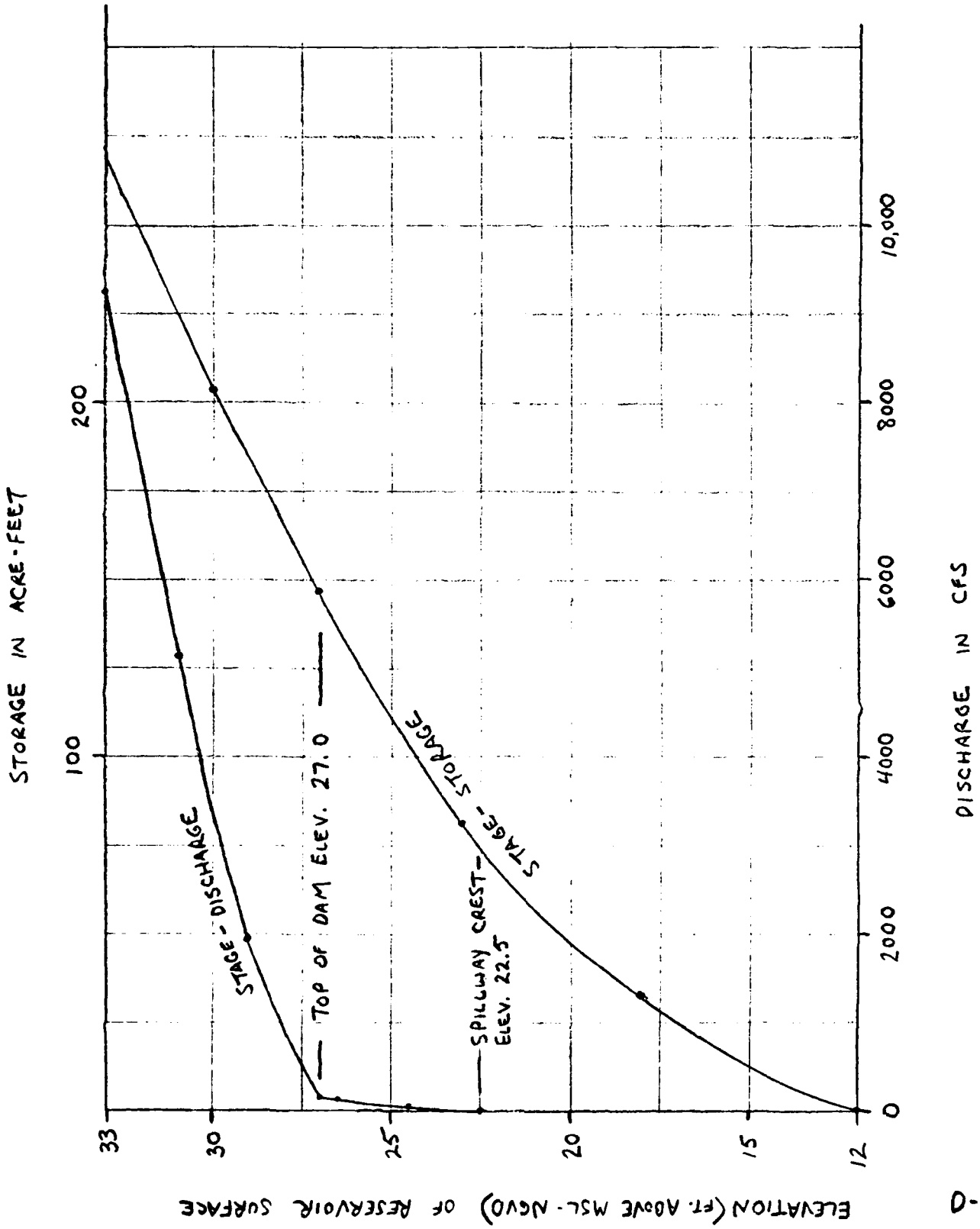
HAZARD AREA #2 CROSS SECTION

dist = 550
slope = 0.004



O'BRIEN & GERE ENGINEERS, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
STAGE-STORAGE & STAGE-DISCHARGE CURVES-FOUNDRY	D-4	RRB		



```
*******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
LAST MODIFICATION  26 FEB 79
*******************************
```

FOUNDRY POND DAM FLOOD ROUTING
WITHOUT BREACHING

INPUT

```
  1   A1                    HYDROLOGIC ANALYSIS OF FOUNDRY POND DAM
  2   A2                         NATIONAL DAM SAFETY PROGRAM
  3   A3                   NEW ENGLAND DIVISION - CORPS OF ENGINEERS
  4   B    200     0    15     0     0     0     0     0    -4     0
  5   B1     5
  6   J      1     6     1
  7   J1   .05    .1   .15    .2    .5   1.0
  8   K      0  INFLOW                                1
  9   K1                   INFLOW TO FOUNDRY POND
 10   M      1     1   2.2                                     1
 11   P      0  21.5   111   124   133
 12   T                                                0   0.05
 13   W    5.4   0.5
 14   X   -1.7  -0.1     2
 15   K      1  FOUND                                 1
 16   K1                   ROUTED OUTFLOW FROM FOUNDRY POND
 17   Y                                1     1
 18   Y1     1                                    -22.5    -1
 19   Y4  22.5  24.5  26.5    27    29    31    33
 20   Y5     0    51   144   172  1961  5150  9254
 21   $A     0     6    20
 22   $F    12  22.5    30
 23   $$  22.5
 24   $D    27
 25   K     99
```

```
RUN  DATE0 03/12/80.
     TIME0 09.32.22.

                    HYDROLOGIC ANALYSIS OF FOUNDRY POND DAM
                         NATIONAL DAM SAFETY PROGRAM
                    NEW ENGLAND DIVISION - CORPS OF ENGINEERS

                                JOB SPECIFICATION
          NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
         200       0      15       0       0       0       0       0      -4       0
                              JOPER     NWT   LROPT   TRACE
                                  5       0       0       0

                          MULTI-PLAN ANALYSES TO BE PERFORMED
                                NPLAN= 1 NRTIO= 6 LRTIO= 1
PERCENTAGES OF PMF  -> RTIOS=    .05     .10     .15     .20     .50    1.00

          **********      **********      **********      **********      **********
INFLOW HYDROGRAPH
  DEVELOPMENT                   SUB-AREA RUNOFF COMPUTATION
                              INFLOW TO FOUNDRY POND
                          ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                         INFLOW       0       0       0       0       0       1       0       0
                                   HYDROGRAPH DATA
          IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
              1       1    2.20    0.00    2.20    0.00   0.000       0       1       0
                                     PRECIP DATA
                   SPFE     PMS      R6     R12     R24     R48     R72     R96
                   0.00   21.50  111.00  124.00  133.00    0.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS  .800
                                     LOSS DATA
         LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
             0    0.00    0.00    1.00    0.00    0.00    1.00    0.00     .05    0.00    0.00
                                  UNIT HYDROGRAPH DATA
                            TP=  5.40    CP= .50    NTA=  0
                                  RECESSION DATA
                        STRTQ=   -1.70    QRCSN=    -.10    RTIOR= 2.00
          UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG=  5.45 HOURS, CP=  .50  VOL=  .95
            1.      5.     10.     16.     23.     30.     38.     47.     56.     65.
           75.     85.     94.    102.    110.    117.    122.    127.    131.    134.
          135.    135.    133.    130.    125.    121.    117.    113.    109.    106.
          102.     99.     96.     92.     89.     86.     83.     81.     78.     75.
           73.     70.     68.     66.     64.     61.     59.     57.     55.     54.

           52.     50.     48.     47.     45.     44.     42.     41.     40.     38.
           37.     36.     34.     33.     32.     31.     30.     29.     28.     27.
           26.     25.     25.     24.     23.     22.     21.     21.     20.     19.
           19.     18.     17.     17.     16.     16.     15.     15.     14.     14.
           13.     13.     12.     12.     12.     11.     11.     11.     10.     10.
        0                          END-OF-PERIOD FLOW
      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q

                                                   SUM  22.88  21.68   1.20  118159.
                                                       ( 581.)( 551.)(  30.)( 3345.89)
```

```
**********        **********        **********        **********        **********

                              HYDROGRAPH-ROUTING

                    ROUTED OUTFLOW FROM FOUNDRY POND

                        ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                        FOUND       1       0       0       0       0       1       0       0
                                          ROUTING DATA
                 QLOSS   CLOSS     AVG    IPES   ISAME    IOPT    IPMP            LSTR
                   0.0   0.000    0.00       1       1       0       0               0

                        NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                            1       0       0   0.000   0.000   0.000   -23.      -1
   STAGE      22.50      24.50      26.50      27.00      29.00      31.00      33.00
    FLOW       0.00      51.00     144.00     172.00    1961.00    5150.00    9254.00
 SURFACE AREA=    0.       6.      20.
    CAPACITY=     0.      21.     113.
   ELEVATION=    12.      23.      30.

                        CREL   SPWID    COOW    EXPW   ELEVL    COOL   CAREA    EXPL
SPILLWAY CREST ELEVATION ->  22.5     0.0     0.0     0.0     0.0     0.0     0.0     0.0

                                                DAM DATA
                                        TOPEL    COOD    EXPD   DAMWID
TOP OF DAM ELEVATION ->                  27.0     0.0     0.0      0.
 PEAK OUTFLOW IS      94. AT TIME  23.25 HOURS

 PEAK OUTFLOW IS     231. AT TIME  21.75 HOURS

 PEAK OUTFLOW IS     359. AT TIME  21.00 HOURS

 PEAK OUTFLOW IS     478. AT TIME  21.00 HOURS

 PEAK OUTFLOW IS    1195. AT TIME  21.00 HOURS

 PEAK OUTFLOW IS    2193. AT TIME  21.00 HOURS
```

STAGE-DISCHARGE DATA

STAGE-STORAGE DATA

ROUTED OUTFLOWS FROM FOUNDRY POND FOR VARIOUS FLOODS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .05	RATIO 2 .10	RATIO 3 .15	RATIO 4 .20	RATIO 5 .50	RATIO 6 1.00	
				RATIOS APPLIED TO FLOWS						
HYDROGRAPH AT	INFLOW	2.20 (5.70)	1	120. (3.39)	239. (6.78)	359. (10.17)	479. (13.56)	1197. (33.90)	2395. (67.81)	PEAK INFLOWS
ROUTED TO	FOUND	2.20 (5.70)	1	98. (2.78)	231. (6.55)	359. (10.16)	478. (13.54)	1195. (33.84)	2393. (67.76)	ROUTED OUTFLOWS

FOUNDRY POND DAM
FLOOD ROUTING SUMMARY

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	22.50	22.50	27.00
STORAGE	21.	21.	64.
OUTFLOW	0.	0.	172.

SPILLWAY DISCHARGE CAPACITY

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.05	25.51	0.00	46.	98.	0.00	23.25	0.00
.10	27.07	.07	64.	231.	3.50	21.75	0.00
.15	27.21	.21	66.	359.	8.50	21.00	0.00
.20	27.34	.34	68.	478.	11.50	21.00	0.00
.50	28.14	1.14	80.	1195.	20.25	21.00	0.00
1.00	29.27	2.27	99.	2393.	25.50	21.00	0.00

TEST FLOOD ELEVATION

ROUTED TEST FLOOD OUTFLOW

```
A1          HYDROLOGIC ANALYSIS OF FOUNDRY POND DAM
A2                NATIONAL DAM SAFETY PROGRAM
A3          NEW ENGLAND DIVISION - CORPS OF ENGINEERS
B     200       0      15       0       0       0       0       0      -4       0
B1      5
J       2       1       1
J1 .0001
K       0   FOUND                                       1
K1                     INFLOW TO FOUNDRY POND
M       1       1     2.2                                                   1
P       0    21.5     111     124     133
T                                                       0    0.05
W    2.75     0.5
X    -1.7    0.05       2
K       1   FOUND                                       1
K1                 ROUTED OUTFLOW FROM FOUNDRY POND
Y                                   1       1
Y1      1                                           -22.5      -1
Y4   22.5    24.5    26.5      27      29      31      33
Y5      0      51     144     172    1961    5150    9254
$A      0       6      20
$E     12    22.5      30
$$   22.5
$D     27
$B     84    0.01      14       1    27.0      40
$B     84    0.01      14       1    27.0    27.0
K       1    DS-2                                       1
K1      CHANNEL ROUTING REACH 1-2
Y                                   1       1
Y1      1                                           -1
Y6   0.06    0.04    0.06       7      30     550   0.004
Y7      0      30     200      20     480     9.5     482       7     488       7
Y7    490     9.5     700      20     800      30
K      99
```

```
*********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
*********************************

RUN  DATE0 02/07/80.
     TIME0 12.09.37.


                    HYDROLOGIC ANALYSIS OF FOUNDRY POND DAM
                          NATIONAL DAM SAFETY PROGRAM
                    NEW ENGLAND DIVISION - CORPS OF ENGINEERS

                                JOB SPECIFICATION
          NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
         200       0      15       0       0       0       0       0      -4       0
                                JOPER     NWT   LROPT   TRACE
                                    5       0       0       0

                    MULTI-PLAN ANALYSES TO BE PERFORMED
                          NPLAN= 2 NRTIO= 1 LRTIO= 1
NO INFLOW → RTIOS=     .00
```

INFLOW HYDROGRAPH DEVELOPMENT

```
**********          **********          **********          **********          **********

                    SUB-AREA RUNOFF COMPUTATION

                    INFLOW TO FOUNDRY POND

                    ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                    FOUND       0       0       0       0       0       1       0       0

                    HYDROGRAPH DATA
          IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
              1       1    2.20    0.00    2.20    0.00   0.000       0       1       0

                    PRECIP DATA
           SPFE     PMS      R6     R12     R24     R48     R72     R96
           0.00   21.50  111.00  124.00  133.00    0.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS  .800

                    LOSS DATA
      LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
          0    0.00    0.00    1.00    0.00    0.00    1.00    0.00     .05    0.00    0.00

                    UNIT HYDROGRAPH DATA
                    TP=  2.75    CP= .50    NTA=  0

                    RECESSION DATA
                    STRTQ=   -1.70    QRCSN=     .05    RTIOR= 2.00

          UNIT HYDROGRAPH 86 END-OF-PERIOD ORDINATES, LAG=   2.77 HOURS, CP=  .50  VOL= 1.00
        7.      25.      50.      81.     114.     151.     186.     216.     239.     255.
      264.     261.     247.     231.     216.     202.     189.     177.     166.     155.
      145.     136.     127.     119.     111.     104.      97.      91.      85.      79.
       74.      70.      65.      61.      57.      53.      50.      47.      44.      41.
       38.      36.      33.      31.      29.      27.      26.      24.      22.      21.


       20.      18.      17.      16.      15.      14.      13.      12.      11.      11.
       10.       9.       9.       8.       8.       7.       7.       6.       6.       5.
        5.       5.       4.       4.       4.       4.       3.       3.       3.       3.
        3.       2.       2.       2.       2.       2.

0                   END-OF-PERIOD FLOW
  MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q     MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q

                                                   SUM  22.HR  21.6R   1.20  122492.
                                                        ( 5R1.)( 551.)(  30.)( 344R.59)
```

```
**********        **********        **********        **********        **********

                              HYDROGRAPH ROUTING

                     ROUTED OUTFLOW FROM FOUNDRY POND

                     ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                     FOUND       1       0       0       0       0       1       0       0

                                 ALL PLANS HAVE SAME
                                      ROUTING DATA
              QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                0.0   0.000    0.00       1       1       0       0               0

                     NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                         1       0       0   0.000   0.000   0.000     -23.      -1

  STAGE      22.50      24.50      26.50      27.00      29.00      31.00      33.00
  FLOW        0.00      51.00     144.00     172.00    1961.00    5150.00    9254.00

SURFACE AREA=     0.      6.      20.
   CAPACITY=      0.     21.     113.
ELEVATION=       12.     23.      30.

                CREL   SPWID    COQW    EXPW   ELEVL    COQL   CAREA    EXPL
                22.5     0.0     0.0     0.0     0.0     0.0     0.0     0.0

                                   DAM DATA
                            TOPEL    COQD    EXPD  DAMWID
                             27.0     0.0     0.0      0.

                                DAM BREACH DATA
                      BRWID       Z    ELBM   TFAIL    WSEL  FAILEL
                        84.     .01   14.00    1.00   27.00   40.00

PEAK OUTFLOW IS      172. AT TIME   0.00 HOURS

                                DAM BREACH DATA
                      BRWID       Z    ELBM   TFAIL    WSEL  FAILEL
                        84.     .01   14.00    1.00   27.00   27.00

BEGIN DAM FAILURE AT  0.00 HOURS

PEAK OUTFLOW IS     1294. AT TIME    .44 HOURS
```

STAGE - DISCHARGE DATA

STAGE - STORAGE DATA

BREACH DIMENSIONS - NO FAILURE OCCURS

(WITHOUT BREACH)

BREACH DIMENSIONS - FAILURE BEGINS IMMEDIATELY WITH RESERVOIR SURFACE AT TOP OF DAM

(WITH BREACH)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

CHANNEL ROUTING REACH 1-2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DS-2	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

FLOOD ROUTING TO DOWNSTREAM DAMAGE AREA

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0600	.0400	.0600	7.0	30.0	550.	.00400

} DOWNSTREAM CHANNEL CHARACTERISTICS

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00	30.00	200.00	20.00	480.00	9.50	482.00	7.00	488.00	7.00
490.00	9.50	700.00	20.00	800.00	30.00				

} CHANNEL CROSS-SECTION AT DAMAGE AREA

STORAGE	0.00	.11	.24	.77	2.16	4.42	7.54	11.52	16.37	22.07
	28.65	36.07	44.14	52.76	61.93	71.66	81.95	92.79	104.18	116.13
OUTFLOW	0.00	18.89	61.28	168.88	459.05	1033.31	1975.46	3360.07	5255.65	7726.27
	10832.55	14717.93	19558.60	25118.94	31420.31	38485.37	46337.54	55000.67	64498.86	74856.27
STAGE	7.00	8.21	9.42	10.63	11.84	13.05	14.26	15.47	16.68	17.89
	19.11	20.32	21.53	22.74	23.95	25.16	26.37	27.58	28.79	30.00
FLOW	0.00	18.89	61.28	168.88	459.05	1033.31	1975.46	3360.07	5255.65	7726.27
	10832.55	14717.93	19558.60	25118.94	31420.31	38485.37	46337.54	55000.67	64498.86	74856.27

} STAGE-STORAGE AND STAGE-DISCHARGE INFORMATION FOR DOWN-STREAM CHANNEL

MAXIMUM STAGE IS 10.5 ← STREAM STAGE AT DAMAGE AREA WITHOUT BREACH

MAXIMUM STAGE IS 13.3 ← STREAM STAGE AT DAMAGE AREA WITH BREACH

********** ********** ********** ********** **********

SUMMARY OF DAM SAFETY ANALYSIS

FOUNDRY POND DAM WITHOUT BREACH

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	27.00	22.50	27.00
STORAGE	64.	21.	64.
OUTFLOW	172.	0.	172.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.00	26.74	0.00	64.	172.	0.00	0.00	0.00

FOUNDRY POND DAM WITH BREACH

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	27.00	22.50	27.00
STORAGE	64.	21.	64.
OUTFLOW	172.	0.	172.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.00	26.98	0.00	64.	1294.	0.00	.44	0.00

DOWNSTREAM DAMAGE AREA WITHOUT BREACH

PLAN 1 STATION DS-2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.00	158.	10.5	.25

DOWNSTREAM DAMAGE AREA WITH BREACH

PLAN 2 STATION DS-2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.00	1194.	13.3	.50

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY	MO	YR
MA	394	NED	MA	023	12				FOUNDRY POND DAM	4159.1	7042.0	22	FEB	80

POPULAR NAME	NAME OF IMPOUNDMENT
	FOUNDRY POND

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	09	SMELT BROOK	KINGSTON	0	6000

TYPE OF DAM	YEAR COMPLETED	PURPOSES	TOTAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	MAX (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
RESERVOIR	1962	C	15	15	65	21	NED	N	N	N	N	

REMARKS
INDUSTRIAL WATER SUPPLY

DAMS HAS	SPILLWAY LENGTH (FT.)	TYPE	WIDTH (FT.)	MAXIMUM DISCHARGE (C.F.S.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	PROPOSED (MW)	NAVIGATION LOCKS NO	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	210	C	6	172	5000											

OWNER	ENGINEERING BY	CONSTRUCTION BY
CORD + DREW COMPANY	UNKNOWN	UNKNOWN

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	MA DEQE	MA DEQE

INSPECTION BY	INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
O'BRIEN + GERE ENGINEERS INC	24	OCT	79	PL 92-367

REMARKS
CREST WIDTH VARIES ABUTMENTS NOT WELL DEFINED

END

FILMED

6-85

DTIC